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MANAGEMENT AND MAINTENANCE

A McGRAW-HILL PUBLICATION

FEBRUARY 1943

Louisville Manpower Control ... page 75

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SCRUWEDGE OFFSET TONGUE
14 SOLID TO 2 STR.
3G - AERIAL CON
300 MCM AND
GMO - SQUARE FLANGE LUG
14 SOLID TO 2 STR.
GY - 90° CABLE TAP
8 STR. TO 2000 MCM
PY - TWO WAY
8 STR. TO 2000 MCM
YS2 - TWO WAY
14 TO 2000 MCM
S - STRAIGHT CONNECTOR
2 STR. TO 2000 MCM
G - SQUARE FLANGE LUG
2 STR. TO 2000000 CM
Y - SQUARE FLANGE LUG
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YS3 - THREE WAY
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2 STR. TO 2000 MCM
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3AG - AERIAL CONNECTOR
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FEBRUARY 1943

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FACTORY

MANAGEMENT AND MAINTENANCE

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How well these problems were solved is evidenced by the flow of Pratt & Whitney engines rolling off production lines in huge engine plants throughout the country. The extreme precision of the gears is a tribute to the engineering back of them, but even more to the new methods of manufacture that have made their mass production possible.

When the war is won these gears, produced in the Precision Gear Plant of Foote Bros., can be applied to peacetime engines and peacetime machines. Manufacturers are then assured of a new era in the transmission of power through gears and speed reducers—an era of more compact, more efficient machines.

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Mining—Number One War Industry

The mineral products of the earth are the prime necessities of war... and peace

THE SURFACE of the earth provided primitive man with the things he needed for his meager existence but civilization really began when he became curious about its interior. This curiosity has brought us a long way. For the earth has yielded — out of its deep recesses — all the raw materials of modern industry. And today, in the grueling race of production, our mining industry is providing the raw materials upon which depends our survival. Our mines and quarries must supply a long list of materials without which a successful war cannot be fought.

Take steel, for example. War without steel is inconceivable. Steel starts with iron ore, limestone and coke. These are products of mines and quarries. It takes power and heat to get these materials out of the ground, to refine them and to transport them to the point where processing begins. All the subsequent operations culminating in the steel ingot, shape or plate, and in moving the final product to the point of use require power and heat.

The major source of this power and heat is coal.

Production of a ton of steel, it has been stated, requires two tons of coal. Smelting of the pig iron alone, 60,000,000 tons in 1942, required the coking of some 75,000,000 tons of coal. Pig output is expected to rise to 68,000,000-70,000,000 tons in 1943, carrying coal consumption up to 85,000,000 tons. At the same time, output of steel ingots is expected to rise from 87,000,000 to 97,000,000 tons. Think what this means in terms of power and heat.

Another vital metal is copper. Modern armies need copper. This point is dramatically illustrated in a recent memorandum by Robert P. Patterson, Under Secretary of War, in announcing the release of 4,000 men from military service to return to the mines and increase copper production. "In a single minute of combat", Mr. Patterson declared, "a flight of 50 fighter planes shoots away 7 tons of copper. A 37-mm. anti-aircraft gun uses up a ton of copper every twenty minutes it is in operation. Six hundred pounds of copper go into every medium tank, and a ton into the engines and airframe of a Flying Fortress. The Signal Corps alone needs 5,000 tons of copper every month for radio and telegraphic and telephonic equipment. An army without copper would be an army without speed, maneuverability or firepower. It would not last a day in battle".

Seven tons of copper for one minute of combat by 50 fighter planes means from 200 to 700 tons of ore, depending upon its grade. Small wonder that the War Department was willing to release drafted miners from military duties to produce more copper.

But other metals are equally important in war: tungsten, nickel, manganese, chromium, vanadium and molybdenum for alloy steels; zinc for brass and die castings; tin for bronze and bearings; aluminum and magnesium for aircraft; lead and mercury for ammunition; silver for electrical equipment, bearings and solder, and so on. Even relatively insignificant non-metallics, like mica and diamonds, suddenly assume critical importance.

And let us not lose sight of the fact that without adequate energy, i.e., heat and power, production, processing, transportation and the relative comforts to which we have become accustomed would be impossible under war conditions. Coal is the major source of energy in the United States. It supplies more than half the total in normal years.

The railroads of the country alone used 110,000,000 tons in 1942 to move freight and passengers and service their facilities. Utilities consumed over 68,000,000 tons in the production of electric power. Over 135,000,000 tons of coal were consumed last year in maintaining the level of heating comfort necessary for the maintenance of efficiency and morale. The consumption, this year, will be even greater.

In short, the mineral products of the earth are the prime necessities of war.

The nations that control the world's mineral resources and make the most efficient use of them will win the victory.

Before the war, the British Empire and the United States together controlled probably 75 per cent of the world's mineral production. This would have been a most potent weapon in the United Nations' arsenal if the whole strategy of Axis expansion had not been influenced by mineral objectives. Addressing the American Zinc Institute on the subject last April, E. W. Pehrson, of the U. S. Bureau of Mines, estimated that the Axis had improved its position in world mineral resources in the following percentages: iron ore, from 6 to 46; steel production capacity, 20 to 34; petroleum, 1 to 7; coal, 27 to 53; copper, 5 to 10; lead, 7 to 22; zinc, 16 to 27; tin, 1 to 72; manganese, 2 to 30; chrome, 3 to 30; tungsten, 6 to 60. In the light metals, areas now Axis-controlled produced in 1940 54 per cent of the world's aluminum, 49 per cent of the bauxite (the principal source of aluminum) and two-thirds of the magnesium.

This is the eighth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

Despite these gains, the industrial war power of the United Nations still can outweigh that of the Axis by a considerable margin. It already has begun to surpass it. The problem is to convert quickly our potential mineral resources into implements of war. In this conversion, a heavy burden of responsibility has been placed on the mining industry of the United States as the largest producer of many metals, minerals and fuels. In fact, the United States mining industry began to go on a war basis a year before Pearl Harbor. The curves of demand for domestic copper, lead, zinc and other metals began to rise sharply in 1940, and were paralleled by a rising coal production.

How well the job has been done cannot be revealed in accurate figures in many cases because of censorship. In metals, however, some idea of production gains can be indicated in comparative terms. United States copper production, for example, is breaking all previous records. Aluminum capacity will be more than seven times its annual peace-time average. Magnesium plants now building will have a capacity 100 times the largest yearly before-the-war figure. Molybdenum, of which the United States has the largest single mine in the world, is being made available in record quantity. Zinc, lead and mercury are surpassing expectations in meeting wartime demands, and tungsten, chromium, manganese, antimony and iron and steel are being turned out in record-breaking quantities.

Bituminous coal production in 1942 was 580,000,000 tons, the greatest in history, valued at more than $1,300,000,000 at the mine. Some 430,000 or more men were employed in 1942 and received at least $750,000,000 in wages. Bituminous production in 1939 was 394,855,000 tons, while the output for 1943 is forecast at approximately 600,000,000 tons – another new United States record. The 1942 anthracite output was 59,961,000 tons valued at over $270,000,000 at the mine. The industry employed some 85,000 men and paid out at least $180,000,000 in wages. The 1939 production of anthracite was 51,487,000 tons, and the forecast for 1943 is 65,000,000 tons or more.

Marshalling the Western Hemisphere's mineral resources, the United Nations have been the beneficiaries of the diversified resources of two continents – in particular of Canada's nickel and coal, Mexico's lead and antimony, Chile's copper, Bolivia's tin, Peru's vanadium, Brazil's iron, and Venezuela's petroleum. With other United Nations contributing their share of metals and fuel, the grand total is an impressive array of potential munitions and matériel to lend assurance of certain victory over the Axis. Sheer weight of metal, properly used, will win the war, and our mineral industry will have played an indispensable and essential part in the inevitable outcome.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

FACTORY
MANAGEMENT AND MAINTENANCE
L · C · MORROW · EDITOR

"Non-Essential" Occupations—Source for War Plant Manpower

In what now are non-essential occupations may lie an important part of the answer to our manpower problem. This part of the answer, if it turns out to be such, will consist of what is left of some 3,000,000 employed males (1940 Census of Occupations) who, presumably, can do essential rather than non-essential work.

Nobody knows just how many men are left in this group, because some have gone into the armed forces and others have secured jobs in war plants. For that matter, there is no official list of non-essential occupations; the nearest we have is a list of the "less-essential."

But the War Manpower Commission, off the record, admits that deferment for dependency is out, which means that occupation alone is left as a justification for keeping the able-bodied males, 18-38, out of service.

There is no reason why they should be kept out. Certainly industry could have no reason to make itself a haven for them. And there is no justification for believing that they want a haven. But it will be some time before Selective Service calls all those who are fit. During that time industry could have some millions of man-hours of work on essential production from these men now in "non-essential" occupations.

Since dependency is out, why don't the men in the non-essential occupations flock to industry? There are several reasons: They don't know or don't believe that dependency is out. They don't believe that their occupations will be classified as non-essential. They are prone to follow their accustomed job routine until forced out of it or sold out of it.

Industry is interested only in the selling, a job that its recruiting personnel will have to do if it is done. If they do it, they will be engaged in benevolent pirating that will have the blessing of WMC and other branches of the government.

What are the non-essential occupations? Remember, there is no official list. But who has not looked at the Census of Occupations? And, having looked, has not seen:

34,000	artists and art teachers
31,000	dancers, showmen, and athletes
70,000	musicians and music teachers
73,000	canvassers and solicitors
48,000	hucksters and peddlers
53,000	newsboys
1,000,000	retail salesmen and clerks
390,000	milliners
143,000	domestic service workers
209,000	barbers and beauticians
500,000	charmen, janitors, and porters
298,000	servants and stewards
141,000	waiters and bartenders
203,000	laborers (trade, not industry)

These 14 classifications total approximately 3,000,000 male employees. They are the major

NOTICE TO SUBSCRIBERS

Readers of FACTORY will observe that the "trim size" of the current issue of the magazine is slightly smaller than that of previous numbers. The reduction in size has been made to enable the publishers to meet an order of the War Production Board limiting the amount of paper that may be used in 1943. Subscribers will note, however, that no change has been made in size of type or in the amount of editorial content per page, but that a substantial saving in paper has been effected merely by trimming the margins.

The publishers have adopted the new size as a war measure and as a contribution to the conservation of manpower and transportation facilities in the production and distribution of paper. Service to the reader has not been sacrificed and will be maintained as far as humanly possible in the face of the problems confronting all of us in our united efforts to win the war.

groups only, and do not include men in jobs under the following classifications and others:

Astrologers, clairvoyants, entertainers, fortune tellers, gamblers, mind readers, palmists, phrenologists, stylists.

Proprietors, managers, and officials of stores, clubs, summer resorts, turkish baths, antique shops, auction houses, cigar stands, drinking places, florist stores, pet stores, toy stores, amusement parks, carnivals, circuses, country clubs, dance halls, pleasure resorts, pool halls.

Clerical and kindred workers, such as advance agents, board boys, collectors, dramatic agents, literary agents.

Service workers, such as bathhouse attendants, bootblacks, escorts, gigolos, lavatory attendants.

Laborers, including gardeners and groundkeepers, circus hands, caretakers at pleasure resorts and race tracks, amusement parks, and bathhouses.

Washington is not going to specify non-essential occupations until it has to. But in the meantime the jobs listed here would seem to be in that classification, as would others than can be picked out by the rule of common sense. Their occupants are the logical and legitimate prospects for jobs on war work.

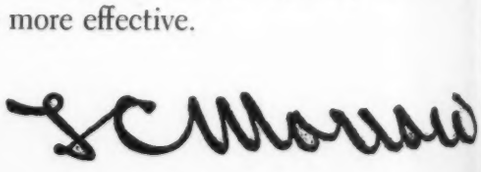
Things That Can Be Done to Avoid a Manpower Law

Compulsory allocation of manpower can be avoided if everybody will work together toward that objective. Why they shouldn't, it's hard to see, because just about everybody is against a law for compulsion. Industry doesn't want it, labor doesn't want it, and the War Manpower Commission doesn't want it.

Here are some specific things which industry, labor, and the government can do to make a compulsory manpower law unnecessary:

1. Increase the length of the work week
2. Increase the production per worker
3. Decrease unnecessary absenteeism
4. Make strikes illegal for the duration
5. Further reduce non-essential production
6. Place orders where people are idle
7. Increase the production per machine
8. Train and upgrade workers
9. Make more use of incentive compensation
10. Improve safety practices to avoid lost time
11. Forego the hoarding of labor
12. Refrain from labor pirating

Of this dozen things to do, the second six are in the hands of industrial plant management exclusively. Something can be done about them—is, in fact, being done, although not to the extent possible and desirable. On these six management should exert its greatest effort, while not overlooking any opportunity to try to bring about the other six and make their advent, if it takes place, the more effective.



THE LOUISVILLE PLAN . . . . . *for* *Manpower Control*

CHARLES B. COATES, *Associate Editor, Factory*

BY FAR THE MOST MEANINGFUL of all local manpower control agreements is now in force in Louisville, where observers believe they see the pattern of the type of program that will prevail eventually in every industrial area in the nation.

Industrial employee turnover was reduced nearly 40 percent during November and December, the first 60 days of the plan's operation. That is the foremost finding of a delegation sent by the War Manpower Commission from Washington to study Louisville's results.

This delegation found also that labor pirating has practically ceased in Louisville and that needless absenteeism caused by "job shopping" has been materially reduced.

The outstanding feature of the Louisville agreement is one requiring employees to obtain "certificates of separation," under rules set up by the War Manpower Commission, in order to change jobs.

The Washington delegation reports that employers are observing the agreement so scrupulously that they will not even interview a job applicant who lacks a certificate of separation. Employees, the delegation says, have with few exceptions accepted as a war necessity the principle that the government can pass on their right to change jobs at will.

Appeal machinery, centering in the local office of the United States Employment Service (now an adjunct of the War Manpower Commission) is said to be working smoothly. Only a handful of appeals from USES decisions have been carried forward to the Louisville Area War Manpower Committee, composed of representatives of management and labor, and this Committee is reported to have dealt with each appeal in unbiased fashion.

What the Plan Provides

The Louisville Plan evolved locally, may prove the prospective prototype of all the plans which, sooner or later, are expected to blanket the nation. To date fourteen local employment stabilization programs have been set in motion by WMC, ranging from the widely publicized "Baltimore Plan" to the lesser-known experiments at Poughkeepsie and Nyack, N. Y. All have varied greatly in conception and results.

WMC officials agree that the Louisville plan goes far beyond the others in its effort to encompass the objectives of National Service on a voluntary basis. The plan, originating in Louisville, was polished up in Washington with the hope that it might provide a basic formula for application throughout the country. Despite its evident success, it is not necessarily considered as complete or final. But it does nourish the hope that voluntary programs can obviate, or long postpone, drastic national manpower

legislation. The Louisville agreement first defines:

1. "The Louisville Area," including Jefferson County and Fort Knox, Ky., and two counties in Indiana.

2. An "essential activity," including direct war manufacturers, shipbuilders, utilities, and so forth.

3. A "critical occupation," such as toolmaker, arc welder, ship fitter, and the like.

4. An "essential worker"—any employee in an essential activity.

5. A "critical worker"—any employee in a critical occupation, whether or not in an essential activity.

The Area Director of the War Manpower Commission is the administrator of the plan. USES is the chief operating agency. Assisting the Area Director in policy matters and in the hearing of appeals is the management-labor Area Manpower Committee.

The agreement then provides that no Louisville employer, essential or otherwise, shall hire a worker unless the applicant presents either a referral card from USES or an appropriate certificate of separation. Employers themselves, if they are in essential activities, may issue certificates of separation to essential (but not critical) workers. Any critical worker, however, must clear his request to change jobs through USES.

A certificate of separation is written on a USES form and simply states that the holder's employment has been terminated for satisfactory reasons and that he may thus be hired upon its presentation—but only for work in an essential activity.

If an employer refuses to grant a certificate of separation, the employee may apply for one to USES, which may grant it, after investigation, but must notify the employer of the reason. In general, the grounds on which USES might reverse an employer come under the heading of "the best interest of the war effort" or the employee's claim of undue hardship.

Similarly, if a worker leaves his essential occupation without good grounds and without a separation certificate, and then applies to USES for referral, USES may send him back to his former employer (without prejudice) or refer him to a job.

Both employees and employers are given the right to appeal to the Area Manpower Commission from any decision of USES.

Further provisions of the Louisville agreement are:

1. On written request of USES, employers shall release any employee hired contrary to the terms of the plan, any worker hired in consequence of his own misrepresentations, any employee hired on USES referral "if it is determined on appeal that such referral should not have been made."

2. To control in-migration, no employer shall hire an individual who did not reside in the area on the effective first day of the plan.

3. Federal government agencies are covered by the agreement.

4. USES shall, wherever practical, make its decisions and take its actions under the plan within a maximum of seven days.

5. The WMC Area Director shall notify all principal employers and unions in the Louisville area of important actions on his part.

6. Union grievance and collective bargaining procedures shall not be affected by the plan.

Policy and Procedure Governing Appeals

Employers, employees, or groups thereof, "if dissatisfied with any act or failure to act pursuant to this plan," shall be given a fair opportunity to present appeals in hearings before the Area War Manpower Committee. The Committee may then recommend action to the WMC Area Director. Further appeal may be carried to the Regional War Manpower Committee, and finally to the National Management-Labor Policy Committee of the War Manpower Commission at Washington, D. C.

In practice, most cases of disagreement go from the plant to a member of the Review Unit in USES. Knotty cases are handled by an informal panel within the Review Unit. Few cases get beyond this stage to the point where they must be heard on appeal by the Area Manpower Committee.

As a policy guide to USES and the Committee, the agreement spells out the principal reasons that may justify the issuance of certificates of separation as follows:

1. When the employee is capable of higher-skilled work than his employer can provide.

2. When he is employed for a substantial period at less than full time.

All-important to the success of this or any local manpower control plan is the 8-man Area War Manpower Committee equally representing management and labor which hears appeals from USES decisions. Here in session, the Louisville committee hears the case of an appellant (seated at corner of table with back to camera) who is facing Harry Hansborough, the WMC Area Director. Clockwise from Hansborough are: G. C. Moore of Westinghouse; H. W. Alderman, alternate for Henry Beatty (CIO); J. Carl Bode of National Carbide; Louis W. Kerberg of The Menzel Company; Edward L. Merkes (AFL); J. E. Richardson (AFL); Alfred N. Smith, alternate for Samuel Despeaux (CIO); and William F. Woodward, of Reynolds Metal

3. When his home is too far from his work under present transportation difficulties.

4. When he can cite "compelling personal reasons" for changing jobs.

5. When he is employed "at wages or under working conditions substantially less favorable than those prevailing in the community for the kind of work for which he is employed."

6. When, if he is a critical worker, he is not engaged in a critical occupation in an essential industry.

How Washington Views "Job Freezing"

So much for the legal outlines of the Louisville agreement. Penalties, fines, and imprisonment for non-compliance (implied in most proposals for National Service along British lines) are notably absent.

This, like all area agreements, is *not*, by definition, true "job freezing" in the strictest sense.

WMC officials at Washington quail at every newspaper headline about the "freezing" of jobs. Much mischief has been done by the phrase. Mere rumors of a "freeze" have been known to touch off a wholesale exodus of employees from plants in the area affected by the rumor. Yet WMC is at its wit's end to make the public understand the distinction.

The fact is that Uncle Sam just simply lacks the power to freeze a worker immutably in his job. Yet, admittedly, the government can do much, through local agreements of the Louisville sort, to curtail aimless movements of workers from job to job. Uncle Sam likewise lacks the power to force an employer to refrain from pirating. Yet the opinion of the public and other employers will have that effect in areas where agreements are in force.

And implied compulsions—or "sanctions"—are present in the background. Offending employers can be deprived of contracts, materials, or transportation. Offending employees can be deprived of government housing privileges, and those of military age can be told to "work or fight."

To date such compulsions have not been invoked in Louisville or anywhere else. Control without coercion remains the chief and most valid principle of the local agreement solution to the manpower problem.

How the Louisville Committee Was Chosen

Three acknowledged key factors in the evident success of the Louisville plan—factors which will have to be duplicated in any area where a similar plan succeeds—are: (1) A well-organized, expanded local USES employment office; (2) a respected, carefully chosen management-labor Area Manpower Committee; (3) a highly competent WMC Area Director in whom both manufacturers and labor organizations have confidence.

The Louisville plan is the outgrowth of an earlier anti-piracy agreement. Thus it did not start from scratch but was developed in a section in which cooperative manpower action was not entirely new.

In the selection of the four manage-

ment members of the Louisville Area Manpower Committee, the principal employer groups had a hand, including the Louisville Board of Trade, the Louisville Industrial Association, the Associated Manufacturers of Kentucky, and the Louisville Personnel Men's Association.

Two of the four labor representatives were designated by the Louisville Central Labor Union and Louisville Building Trades Council (both AFL); the other two, by the Louisville Industrial Council (CIO).

Harry Hansborough, WMC Area Director, functioned from the start as "spark plug" of the program. His work won the unqualified praise of the WMC group sent from Washington to check up on Louisville's results.

How the Plan is Working

To STUDY the Louisville plan after 60 days of operation went a group from WMC headquarters in Washington headed by Alexander A. Liveright, Director of the Field Management Unit, who earlier had initiated and installed the first notable regional manpower agreement in Baltimore.

Assisting Liveright in the study were Hazel Guffy and C. E. Milliken of the WMC Placement Division, Charles Kidd of the Program Planning Division, and John Henry of the Office of War Information. Henry laid plans for an OWI public opinion poll, the results of which will probably be announced by the time this article reaches the reader.

The objective tone of their report indicates that Liveright and his group were searching as sincerely for "bugs" as they were for virtues in the Louisville set-up. Liveright's earlier experience in Baltimore specially qualifies him as an analyst. He believes that the Louisville program goes far beyond Baltimore's (which was chiefly successful in halting pirating), and foresees that, in outline, it will stand up as a pattern for future agreements.

Here are the outstanding findings in the Louisville plan's favor:

1. Employers and employees have given almost complete acceptance to the plan and enjoy a full sense of participation in it.

2. Employers, fully aware of the plan's implications, are observing it scrupulously. *Evidence:* Kidd, representing himself as an in-migrant arc welder (scarce in Louisville) went to six of the principal plant personnel offices in the city. All asked to see his certificate of separation or USES referral card. In only one was he so much as interviewed. The others referred him to USES.

3. Piracy in Louisville is practically at an end.

4. Employees are conscious of, and approve of, the plan. *Evidence:* Kidd, in conversation with 40 typical workers, found that all were familiar with the certification system, and that all but two knew of the functions of USES. None, he said, seems to feel that he has been "frozen" in his job.

5. Turnover in the principal essential and war industries of Louisville has been reduced from an average of 23 percent for the 60-day period preceding adoption of the plan to 14 percent in the 60 days following—a figure made even more remarkable by the fact that it includes military separations which have risen rapidly. (See table on page 79.)

6. Absenteeism has dropped sharply. No exact figures are available, but employers agree that the plan has eliminated the "job shopping" in which voluntarily absent workers were formerly wont to engage.

7. The plan tends to improve personnel practices within the plant. Most employers now make a policy of the "exit interview." A single large company dissuaded several hundred workers from leaving during a period of four weeks.

8. The USES office has kept abreast of the increasing load occasioned by the plan. Formerly it handled about 20 per cent of war job placements; now it averages 50 percent. Its own personnel has increased from about 60, prior to the plan, to over 90, and must reach an estimated 150 by March in order to keep pace with its indicated task.

The cases in which employers and employees have been unable to agree on separations or transfers have been

Spark plug of Louisville program is Harry Hansborough, Area Director of War Manpower Commission, whose work won praise in survey

Louisville Plan Cuts Quit Rates

Nature of firm's business	Number of employees	Rate, 60-day period [1]	
		Preceding program	Following program
Total	25,880	23	14
1. Special mining equipment	275	2	4
2. Metal products	1,500	14	5
3. Construction [2]	1,000	125	129
4. Motor transport	600	3	4
5. Transportation equipment	200	35	11
6. Metal products	225	18	8
7. Ship subassembly	700	9	9
8. Ship manufacture	6,500	9	7
9. Clothing for military forces	400	30	27
10. Aircraft modification	300	11	3
11. Iron foundry	200	43	47
12. Wood products	225	33	4
13. Ship subassemblies	200	28	9
14. Metal products [3]	200	42	36
15. Electrical equipment	180	7	4
16. Metal products [4]	900	32	43
17. Wood preservation	550	23	30
18. Ordnance plant	3,000	9	8
19. Aircraft production	1,700	14	6
20. Munitions	2,600	18	8
21. Metal working	425	27	27
22. Light metal products	4,000	24	7

[1] Includes military separations. Since military separations have risen rapidly in Louisville, these figures tend to understate the decrease in separation rates attributable to non-military reasons

[2] Employment is declining rapidly; separation rate therefore remains high

[3] Is laying off a large number and not re-hiring because work is slack

[4] This firm lost a contract and laid off a large number of workers

relatively few, totaling only 900. Only 9 of these have actually required hearings before the weekly appeal session of the War Manpower Committee. The rest have been handled with entire satisfaction by the Review Unit of USES.

Individual staff members of the Review Unit handle most of the cases successfully, occasionally calling an informal committee to handle the more complicated cases, which amounted to 12 percent of the total.

9. Only 7 percent of the workers who brought their cases to USES for review proved recalcitrant upon receiving its verdict and refused either to go back to work or to appeal further to the Manpower Committee; 33 percent were sent back to their original jobs, and complied; 56 percent were upheld and given certificates of separation; and 4 percent were directed to specific jobs by USES.

By percentage, these are the issues on which employees took their cases to the government: Workers felt job was beneath his skill, 35; pay unsatisfactory, but not sub-standard, 19; "compelling personal reasons," 16; "worker quit the job," 10; worker employed less than full time, 9; sub-standard wages, hours, and working conditions, 7; distance from work too great, 3; critical worker not in essential industry, 1.

10. In hearing appeals which have reached it, the War Manpower Committee has been completely unbiased and fair. The character and prestige of the committeemen have been, by and large, big factors in public acceptance of the plan.

Plan's Weaknesses and Limitations

Experience has exposed certain flaws in the Louisville experiment. One of these is its acknowledged failure to put a curb on in-migration. The uninvited migrant worker has been quick to learn the trick of providing himself with a pre-dated Louisville address. If he has trouble getting a war job, he finds an all-too-warm welcome from non-essential employers. WMC is pondering one suggested remedy—to make a separation certificate a condition for admission to government housing projects.

Another weakness is lack of an adequate program to accomplish the transfer of critical workers from less essential to essential industries. A tobacco company handed over half of its machine shop workers to a shipyard, but there has been no organized attempt to carry out this policy on a wide scale.

Many pronounced wage differentials threaten to become a serious source of irritation which may seriously hamper the further success of the plan. It is significant to note the extent to which plans of this sort project WMC willy-nilly into labor relations. Certain grievances, for example, are bound to get out into the open and must be adjudicated along with other issues.

As for wages, the plan tends to discourage the "shopper" who seeks to gain a 5- or 10-cent-an-hour increase by changing jobs. Yet the worker who can point to a 25- or 30-cent differential has a real bone to pick, especially if living costs are visibly causing him hardship. This gives WMC an increasingly hard row to hoe—especially since some employers paying sub-standard wages are inclined to refer all quits to USES rather than grant certificates of separation themselves.

This situation indicates that WMC may have to take cards in the wage stabilization game by making recommendations to the War Labor Board for authorized increases in certain plants.

The relationship of Selective Service Local Boards to WMC, in areas where agreements prevail, is shown by the

Louisville's busy United States Employment Service office makes 50 percent of war placements

Louisville experience to be decidedly fuzzy. The question of the degree to which one agency should affect the operations of the other is, according to the investigators, an open one. Some Louisville employers have suggested that WMC take a hand in helping local boards to evaluate deferment requests. Selective Service officials are opposed on the ground that this would tend to limit the autonomy of local boards. All are agreed that the problem is an important one which remains unsolved.

What the Plan Means to Management

BY ALL THE SIGNS, WMC intends to install local manpower agreements in every industrial area of any consequence in the country as fast as possible. Some optimists in WMC have said: "Within three months." By all the signs, the Louisville agreement contains the framework of all future agreements, whatever variations may occur. And by all the signs, WMC, once it gets going, will not wait for area management-labor groups to propose or formulate their own plans, but will instruct area directors to move in and inaugurate agreements on their own initiative.

Thus the Louisville plan is clearly worth the closest attention of industrial management the country over. These factors must be borne in mind:

1. Most USES local offices would find it hard indeed to duplicate Louisville's good performance. The Louisville employment office was already well established by comparison with most. The Kentucky USES State Director, having no pronounced agricultural manpower problems, was able to transfer quite a bit of picked personnel from other state offices. In this sense, Louisville was distinctly a USES "dress rehearsal."

2. Highly capable regional and area WMC directors are hard to get. Just as the low salaries paid by USES make staffing of that agency difficult, so WMC itself is sadly hampered by the fact that it must obtain Congressional approval of all appointments to jobs paying $4500 a year or more. The simple fact of the matter is that WMC has not yet hired even half of the area directors it will eventually need, far less the personnel they will need to assist them.

3. Louisville, while it furnished an inviting setting for the experiment, has not yet faced a severe general labor shortage, and is hence not wholly typical. It ranks as Class 3 in WMC-designated areas (i.e., it can still take new war contracts). If the Louisville labor market were tighter, the plan's results might not have been quite so impressive.

Thus, while the Louisville experiment is of the utmost importance to management nationally, the individual reader should temper his estimate of the time when such a plan may reach his community by the foregoing facts. A good guiding rule is this: WMC will strive to institute agreements first in Class 1, or critical labor shortage areas, where the lack of manpower is not only general and acute, but where housing is exhausted and transportation strained, so that the government is actually trying to cancel war contracts. Next will come Class 2 areas where serious shortages of labor, housing, and transportation are anticipated within six months, and where existing war contracts may be renewed, but no new ones may be let. Next will come Class 3 areas of the Louisville type. A Class 4 area is one in which a labor surplus exists.

A REPORT TO INDUSTRY

What's New About the Controlled Materials Plan

For basic features of the plan see the article, "The Controlled Materials Plan," by Donald M. Nelson, and the supplemental chart, both published in *Factory* for December, 1942

SUPPLEMENTING its earlier presentation, FACTORY publishes the following notations, gathered in Washington, for the guidance of management as industry swings into the first phase of CMP's actual operation.

These are highlights, designed to set forth the points of information which should be in the forefront of the management man's mind as he embarks on a detailed and serious study of the official CMP publications.

Some of the following items underscore facts which the reader himself may overlook in his perusal of the necessarily voluminous government announcements relating to CMP.

Time Element

CMP officials are repeating, with last-moment emphasis, their warning that manufacturers (hereinafter known as "consumers") must "get in" on the Controlled Materials Plan by the February 9 deadline or risk losing their chance to obtain controlled materials under the Plan in the second quarter of 1943.

The CMP "Library"

Managements preparing to operate under CMP should accumulate, if they have not already done so, and keep together in one place, the War Production Board's principal publications on CMP. These will be the "tools of the trade," to most of which frequent reference will be necessary.

They include: "The Controlled Materials Plan, Official CMP Class B Products List," "CMP Regulation No. 1," and "CMP Regulation No. 2," (relating to inventory restrictions). Forthcoming at the time of this writing, were four more regulations, as yet unnum-

bered. One will deal with MRO (maintenance and repair orders), another with PRP (Production Requirements Plan) and the manner in which its operation will be integrated with CMP, and another with warehouses and other distributors. Copies of these publications will probably prove obtainable at WPB regional and branch offices.

Importance of "Reg. One"

For a fundamental understanding of CMP, every consumer is besought by officials to read and re-read CMP Regulation One. It is the law of the CMP. It spells out all the definitions and procedures. It is background, giving the clearest picture yet drawn of the overall operation of which the individual consumer is a part—an understanding of which will enable him to discharge his own obligations more intelligently.

Bills of Material Overemphasized

WPB realizes that too much was said about Bills of Material in the early announcements of CMP. Today the importance of their role in the Plan is exaggerated in most minds. The real workhorses of CMP will be the applications for allotments—Forms CMP 4A, CMP 4B, and CMP 4C. Chief significance of the Bills of Material will be their use in determining requirements and as a check on the reasonableness of applications for allotments.

Incidentally, there is no timetable for the collection of Bills of Material. Claimant Agencies will begin to call for them when needed.

Generally speaking, Summary (Form CMP One) and not Detail (Form CMP Two) Bills of Material will be requested. Detail Bills are most likely to be used in cases where frequent changes in product design are in prospect.

Each Claimant Agency has been instructed to try to find out whether a Bill of Material has already been collected by some other agency before requesting one itself. But officials warn that the consumer may receive one or several requests for the same Bill from different agencies—some duplication being unavoidable. The consumer is urged, therefore, to prepare his Bills in multiple and put a few carbons aside. They may come in handy.

Notes on the "B" List

Once again: The controlled materials are "steel—both carbon (including wrought iron) and alloy—copper (including copper base alloys), and aluminum"—all three in specific shapes listed in Schedule One, Reg. One.

If a consumer uses none of these, what is his role in CMP? That's easy. He does not have to file a CMP application. If he does use them, is he a prime consumer or a secondary consumer? That's fairly easy. If his customer is a Claimant Agency, he's generally a prime consumer. If he sells Class A products to one or a number of private companies, he's probably a secondary consumer. Many consumers, having various orders, are both. Producers of Class B items are usually prime consumers.

Reg. One defines as a Class A product any product which is not a Class B product. Another way is to say that practically all combat items are Class A end products, and so are most of their components. The official Class B product list issued by WPB on Dec. 21, 1942, has grown to booklet size, largely in the interest of exactitude, and it is still subject to change without notice. It is not as formidable as it seems, however, if the purpose of the classification is kept in mind. The "B" list endeavors to encompass the following kinds of products: (1) Civilian type end products, like farm machinery and sewing machine needles, which are distributed through thousands of outlets; (2) industrial machinery and equipment, which are sold to thousands of firms, except where these are specially designed and installed in conjunction with construction projects; (3) products which require very small quantities of controlled materials, like wood furniture and apparel findings; (4) certain components, like standard bolts and nuts, electric motors, and so on, which are ordered, in general, in small quantities, frequently from the shelf, and whose producers supply thousands of customers.

With certain exceptions, it boils down to this generality: The Class A end product manufacturer sells more or less directly to the government and gets his materials allotments under CMP from one or several Claimant Agencies, whereas the Class B product manufacturer does his selling to a wide variety of customers and does his CMP business with the appropriate industry division of WPB—much as under PRP.

New Claimant Agencies

Since FACTORY's December report, a number of new names have been added to the official list of Claimant Agencies which now includes (symbol in parenthesis): War Department (W)—except Ordnance (O); Navy Department (N); Maritime Commission (M); Air-Resources Control Office (C); Office of Lend-Lease Administration (L); Board of Economic Warfare (E); Office of Civilian Supply (S); Department of Agriculture (A); Office of Defense Transportation (T); Office of Rubber Director (R); Facilities Bureau of WPB (F); Petroleum Administration for War (P); and National Housing Agency (H); and the newest one, the Office of Power Director.

The CMP 4 Forms

Much of industry's most important paperwork will be done on the forms CMP 4A, 4B, and 4C, which are applications for controlled materials allotments. The 4A forms are prepared both by prime and secondary consumers manufacturing Class A products and are presented to Claimant Agencies. The 4B forms are always filed directly with the War Production Board. Allotments for Class B products will be made in most cases by the WPB's Office of Civilian Supply through the Industry Divisions handling B products.

The 4A form may be used by consumers to make allotments to secondary consumers. It is especially important to note that the 4A form is used in every instance in which a secondary consumer files an allotment request with a prime consumer—including manufacturers of Class A products incorporated in Class B products.

CMP 4C is the application form for construction and facilities, while CMP 5 is the short form on which consumers can make allotments to secondary consumers that require very few different material shapes.

Maintenance, Repair, and Operating Supplies

The short name is "MRO." The regulation covering MRO will be issued shortly. This regulation will outline a simple method for obtaining products and materials for maintenance, repair, and operating supplies. The definition of MRO will probably include "those items normally carried as such according to established accounting practices". And perhaps minor capital additions not exceeding $500 in cost.

Until the text of the MRO Regulation is completed and made public, the exact procedures which it will outline are, to some extent, a matter of guesswork. One analyst who has made a close study of CMP's development and is hence well qualified to register a guess, has this to say by way of forecast:

"If the MRO plan is carried out according to present indications, it will take shape in outline about as follows: To secure MRO for consumption, industries will probably be divided into two principal groups, One and Two. Group One consumers will then secure controlled materials in any form for necessary maintenance or repair of facilities by endorsing purchase orders with the proper certification and marking the order MRO. Orders thus marked will have the same status as those bearing allotment numbers under CMP Reg. One.

"If this procedure is adopted, then MRO Group Two industries will secure carbon steel —but only carbon steel—in the same manner. Other controlled materials will be secured through applications on Form PD-1A and the applications will be made to the appropriate WPB Industry Division. For materials other than controlled materials, MRO Group One industries will be assigned an AA-1 for quick repairs made necessary by actual breakdown or imminent breakdown. A rating of AA-2-X will be assigned to normal operating, maintenance, and repair requirements. In this field, MRO Group Two industries will be assigned an AA-2-X while all others not listed in either group will get a rating of A-10."

Integration of CMP With "M" and "L" Orders

CMP necessarily collides with a number of existing WPB limitation and simplification orders. An example is L-170, limiting manufacture of farm equipment to a percentage of a base period. This program of integration is being studied and the governing CMR regulation will be forthcoming within a short time.

Here again, until the Regulation is published,

the exact nature of the new procedure will have to be a matter of speculation. An "educated guesser" has predicted that, in general, the integration process will be worked out about as follows:

"For the present CMP allotments will probably be keyed to the quota set by the L order but by July 1, 1943, the quotas will be eliminated and allotments will take their place as the sole control. If that proves to be the case, the applicable manufacturing quota restrictions will remain in effect until July 1.

"As for WPB orders prohibiting the sale or fabrication of certain products, except to fill orders bearing a preference rating above a certain grade, WPB will probably, about April 1, 1943, incorporate in CMP procedure the following principle: Any delivery order for a controlled material, bearing an allotment number with a preference rating, and for which an allotment of controlled materials has been made, may be produced and shipped regardless of preference rating limitations."

Again the reader is reminded that this forecast must remain in the realm of speculation until the text of the integration order is announced.

Inventory Control

CMP Reg. Two sets up a general inventory limitation of 60 days' supply, and prohibits, with minor exceptions, the acceptance of deliveries which would increase inventories above this level. The regulation provides for WPB redistribution of excessive inventories and requires that users of controlled materials, including governmental agencies, file inventory reports on Form CMP 7. Three copies of this form *must* be filed by February 22 by every person who has filed a PD-25A application for the first quarter of 1943.

Bidding on "A" Products

Procurement officers will contract with industry, just as in the past, for procurement of items they need. In long-continuing transactions, the application and allotment procedure will follow the standard pattern. If, however, the consumer is bidding on a new item for delivery within a limited time, he may be asked to furnish information as to his requirements for controlled materials so that immediate allotment can be made and the materials ordered as soon as the contract is placed. The application under these circumstances will be based on engineering estimates.

While contracts for some Class B products may be placed by Claimant Agencies, the allotments will come, in these cases, from WPB's industry divisions. Note well that, although CMP 4B forms will be sent to all listed manufacturers, *the initiative in making application to receive allotments will rest with the Class B manufacturer.* On receipt of the allotment, the procedure for placing purchase orders and delivery orders will be the same as that for Class A products.

Warehouse Stocks

It is the announced intention of the WPB controlled materials divisions to build up warehouse stocks by April 1, 1943, when CMP takes hold, to the highest possible level. Eventually, deliveries of aluminum, copper, and steel will be controlled by the provisions of the Warehouse Regulation.

Distributor's Role

CMP is still engaged in working out a plan by which distributors may obtain material from producers. Until July 1, 1943, or until a new Distributors' Regulation is issued, distributors will continue with their present method of priority extension. For the present, also, distributors will continue to sell and secure non-controlled materials and Class B items under existing preference ratings.

CMP Officials Join in Plea for Accuracy

All officials concerned begin and end every discussion of CMP with a prayer for accurate estimates of materials requirements on industry's part, and for correct scheduling and budgeting of materials within the plant. They point out that any widespread "padding" or error in requests for allotments will defeat the whole purpose of CMP and deprive all consumers of its benefits. Little has been said officially, lately, of the criminal penalty provisions of CMP, but they're still there—at the end of Reg. One.

Where Is Labor Headed?

Union victories and the war have left labor leaders with little to fight for. Will they now scrape the bottom of the barrel for new "causes," or will they become more cooperative with management?

WHITING WILLIAMS, Consulting Editor, *Factory*

BACK IN '36 an American diplomat was congratulating M. Jouhaux, the head of France's General Federation of Labor, on having secured from Premier Blum all five of his demands. Since these included the 40-hour week, huge wage increases, collective bargaining, and paid vacations, their granting was rightly dubbed the "Blum Revolution."

To the diplomat's amazement, Jouhaux registered great unhappiness: "I took with me five separate documents for the premier's signature. If he refused to grant all my demands, I stood ready to get his signature for only four—or three, or two, or one. But what did the big chump do but give me, at once, everything I asked! *How does he expect me to keep my members paying dues when they've nothing left to fight for?*"

Our labor leaders here are not completely in M. Jouhaux's predicament. Nevertheless, several officers of aggressive organizations have recently indicated to close friends very much the same where-do-we-go-from-here state of mind. Today their union flag flies peacefully over most of the citadels whose winning appeared, only a short while ago, to require exactly that variety of belligerent pressure on the employer which they most delighted to apply.

Rough Tactics

Today, too, the roughest of tactics for enrolling and retaining members have been blessed by the Supreme Court, even though they have long shocked and offended a fair-minded public. But the trouble is that these militant methods have become largely outmoded now that wage increases, back pay, vacations, closed and union shop, maintenance of membership, check-off, and all such-like are to be sought no longer from the employer but instead from the government, no longer in the plant but in Washington. With so many of the most aggressive leaders able to report "mission accomplished," it is not strange if some of the more thoughtful of them are troubled by a new and unexpected problem:

"We're sitting pretty now. But to make it last, we must somehow find new ways of keeping close to and serving our members."

Their biggest puzzlement is, of course, furnished by the war and its various concomitants.

Hard to Hold

For many years the AFL trades or craft unions gave slight attention to organizing the country's unskilled workers. The reason was that, while they found these workers easy to sign up, especially in hard times, they also found them extremely difficult to hold. Glad to pay dues when they needed job protection, these tradeless men usually scattered as soon as good times and job abundance made such protection hardly worth the price of dues. Because of this, one of the AFL leaders at the 1934 pre-CIO convention in San Francisco gave to these unreliable members the name of "Trash."

But this trash represented too many millions of good though unskilled earners in the mass production industries to remain neglected. So into this huge field came John Lewis and his CIO, flying the banner of "Organize the Unorganized!" In addition to furnishing the protection of seniority and gaining big wage increases, CIO persuaded its members, with the help of the country's legislators and political leaders, that the old American tradition of paying marked differentials to the man of skill was nothing short of wicked—also that the worker's search for a chance to climb the ladder of promotion was a lot of hooey.

Moreover, CIO found it easy, again with the help of political leaders, to preach salvation through a working class organized to fight nationwide class conflict. Besides being organized on lines calculated to delight Communism's Father Marx, this battle was led by specialists, many of whom received their training directly or indirectly from Moscow. For details of the resultant battles, consult the newspapers of a short time ago.

Then came Pearl Harbor—and, along with it, alliance with Russia! On the instant the shortage of jobs which had been universally preached as permanent turned into a shortage of men. After that came the change from industrial to political relations, the promise of no strikes, and later the decided dimming of prospects for further wage increases. All this at a time when union membership, in the most important mass production industries, was near the saturation point; when union treasuries, theoretically at least, were full; when union shop, closed shop, and maintenance of membership were widespread; when, also, and perhaps most puzzling of all, the great majority of the rank-and-file members of even the most belligerent unions were asking, even as you and I:

"How can we give our utmost? How can we help lick the Japanazis?"

What a perplexing dish to set before kingly leaders whose greatest thrill had been to head the class struggle against the hated employer!

What to Fight For?

How can you fight for seniority, for instance, when your members are asking "Fire me? So what? I can get a better job across the street."

How can you hold your class lines intact when some of your members are earning so many thousands yearly that their biggest worry has become the same as their employer's—how to pay their income tax?

How can you keep pooh-poohing proper wage differentials for skill when, as lately happened in Detroit, the heads of an affiliated skilled subunion (Maintenance Workers Council) walk out on you, complaining that "For six years we've tried in vain to get proper attention from a union (UAW-CIO), 90 percent of whose members are unskilled."

In a word, how can a leader maintain the spirit of conflict and crusade, on which he has depended, when he has disposed of so many of his

(*Continued on page 178*)

Machine Load Board Keeps Pl

E. J. KEENAN, Standards Department, Cadillac Motor Car Company, Detroit

WITH a constantly expanding schedule of war production, we needed some scheme which would tell at a glance just what the situation was regarding the parts requirements as of a given date. We had roughly 900 machines in the plant, and it was necessary to know how an increase in schedule would affect each machine. Because schedules have been constantly increasing during the past two years, a means had to be devised whereby tool design and standards departments could order the added equipment in time, as well as keep the plant in balance. This purpose is served by the machine load board.

The board itself is 20 feet long and 9 feet high. It can be read from any position in the standards department where it is maintained. It is primarily for overload computations and is set up to indicate the machine load for a definite schedule, say six months from the current date. Lack of sufficient capacity to meet a projected schedule is indicated graphically for each machine, and buying schedules for equipment may thus be inaugurated. Receipts of such equipment are also shown graphically—successive solutions to prospective bottlenecks six months ahead may thus be contrived.

First, tool process sheets from the tool engineering department indicate the operations and the machines upon which the operations are to be performed. The standards department then adds to this information the time for each operation, and computes the machine load analysis sheet (illustrated below). The conditions as calculated are then ready to be posted to the graphic board, which shows the following facts:

1. Types of machines—such as automatics, turret lathes—with every machine in the shop listed under its type.
2. Department in which each machine is located.
3. Number of each type and size of machine in each department.
4. The hours scheduled against each machine in each department for the prospective schedule.
5. The over- or undercapacity of each machine for the prospective schedule.
6. Single-purpose or multi-purpose machines.
7. Machines ordered.

Recitation of these facts alone indi-

(*Continued on page 184*)

As production for war gains momentum, it becomes more than ever necessary to use every machine-hour. A board that shows at a glance when bottlenecks might occur, allows corrective action to be taken or additional machines purchased well in advance of the time that a disastrous work stoppage might occur

MACHINE LOAD ANALYSIS

Machine Name 25 A Heald Rotary Grinder No. of Machine 4

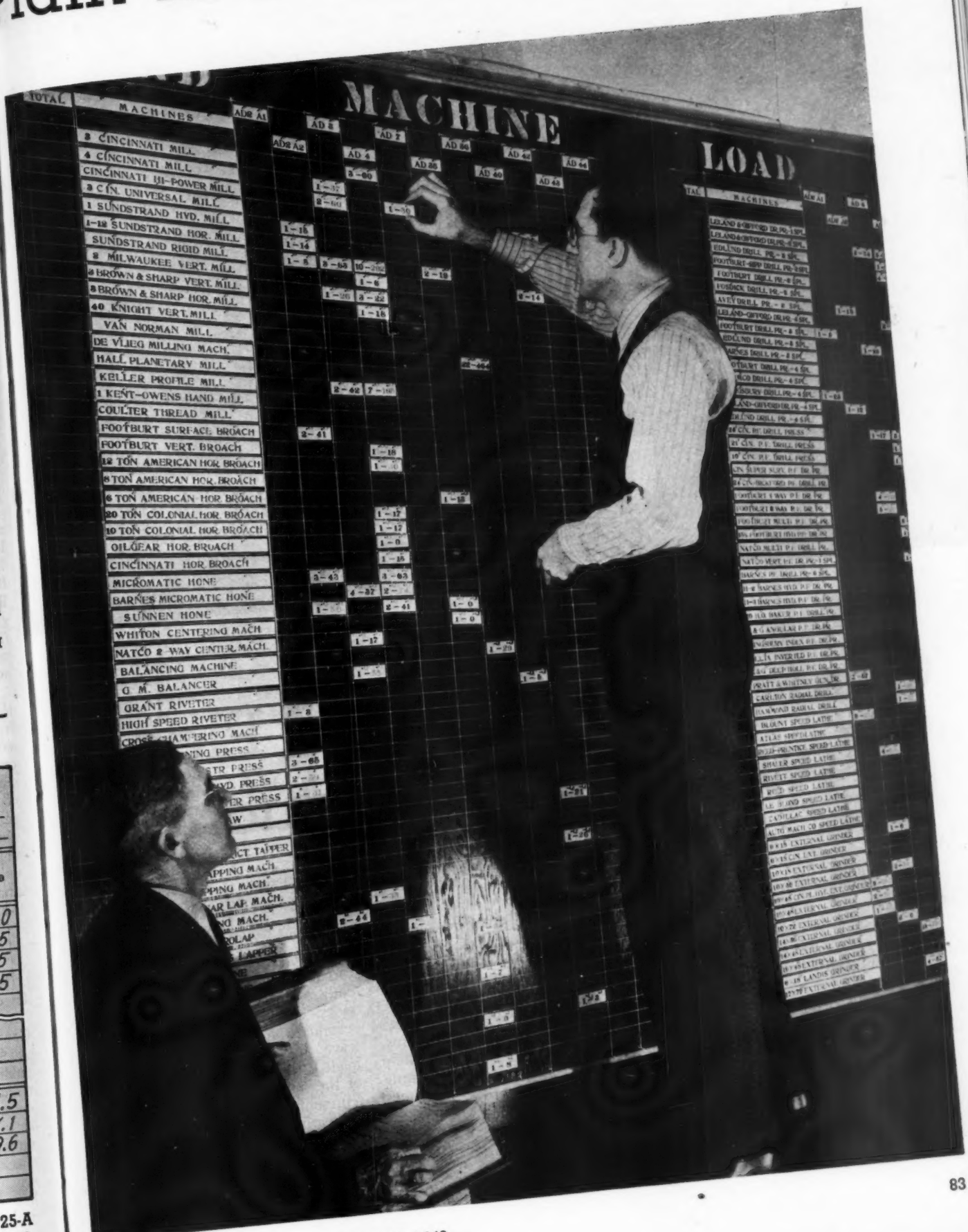
Date _____ Issue No. _____ No. of Sheets _____ Sheet No. _____ Dept. 25 Group _____

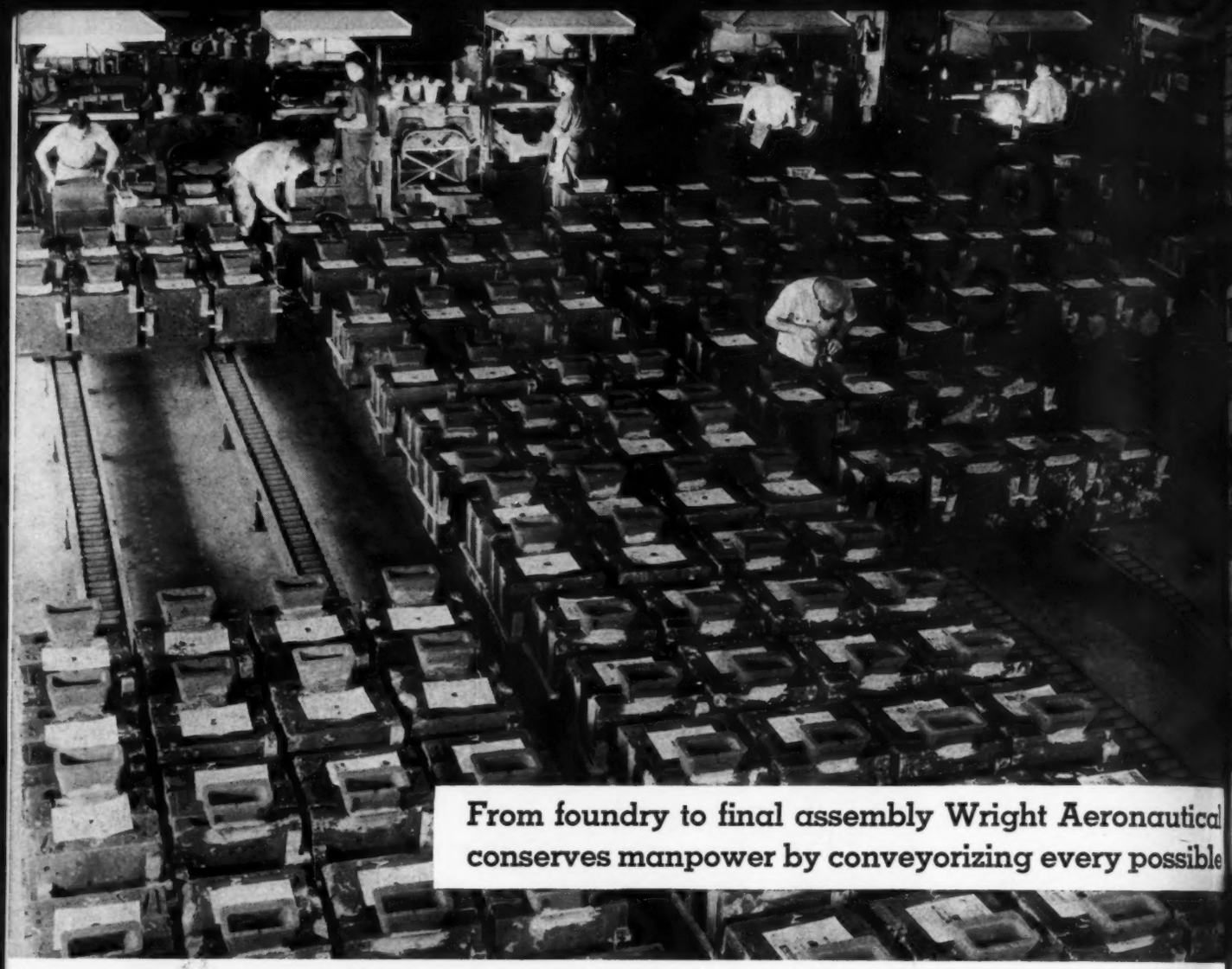
Part Number	Part Name	Oper. No. R.T.	Oper. No. T.S.	Standard Hours per Piece: Actual	Cycle Loss	Set Up	Total	Pieces per Unit: A	B	Pieces per Day	Total Machine Hours
68233		210					.2545	1	1	75	19.0
71256		80					.0872	2		75	6.5
87749		140					.1250	2	2	150	18.5
98281		95					.1667	3	3	225	37.5

Mach. No.	Remarks:		
15572		Total Actual Machine Hours per Day	81.5
15573		Allowance for Contingencies	8.1
15574		Total Load Hours per Day	89.6
15575		Underload per Day	
		Overload per Day	

Figures on this machine load analysis sheet are fictitious. On the board, the machine card in the space for department 25, and after the name 25-A Heald Rotary Grinder, would be 4-90—both black

Plant in Balance





From foundry to final assembly Wright Aeronautical conserves manpower by conveyorizing every possible

Conveyors Save This Plant's Manpower for Production

A COMPLETE CONVEYOR SYSTEM installed at one of its plants has enabled Wright Aeronautical Corporation to convert into productive work the many man-hours formerly consumed in moving parts from machine to machine and from one operation to the next.

Conveyorizing extends to all parts of the factory, including the foundry. Cylinder head molds are placed on stout boards, four molds to a board, and travel on pairs of roller conveyors from the assembly benches to the pouring stations, and thence to the knockout floor. A small single conveyor line runs down one side of the foundry floor to handle the molds in which test bars are cast from each heat of metal.

Both core and molding sands are likewise handled by belt conveyors from the storage bins to the mixing equipment, and thence to the individual molding or core-making stations where the sand is delivered by plows from the belt to the operators' bins. The familiar wheelbarrow is entirely eliminated, and floor space commonly occupied by piles of sand becomes available for productive work.

After snagging and cleaning, cylinder heads are loaded on racks holding 64 pieces and carried by conveyor into the heat-treat ovens. An intermittent drive is employed for this conveyor, which is also synchronized with the automatic door-opening mechanism so that at fixed intervals the inlet and exit doors open, one rack enters the furnaces, another leaves at the rear end. Following a cooling period, racks enter another oven for the secondary heat-treat. As the racks leave this second oven they are unloaded, then pass around to the front of the first oven for reloading. This represents a decided improvement over the earlier method whereby racks of cylinder heads were wheeled into individual ovens, removed to separate cooling tunnels, then placed in other ovens for the secondary heat-treat.

In the machine shop, cylinder

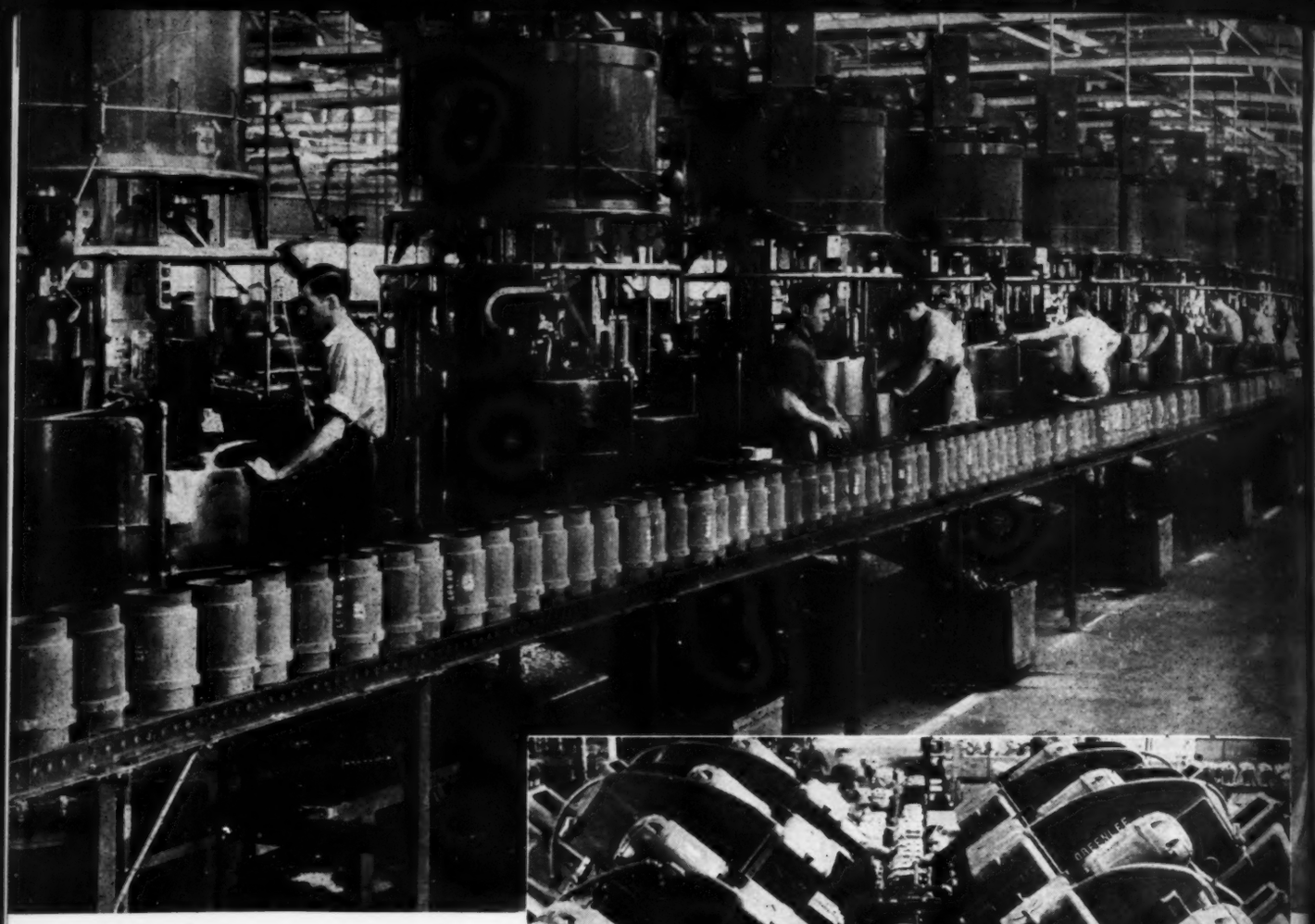
move job. Result — the steady flow of parts so vital to the maintenance of high production schedules

In groups of four, cylinder head molds (on facing page) ride roller conveyors from assembly to pouring station. Above, chain in floor moves Cyclone engines along powered assembly line

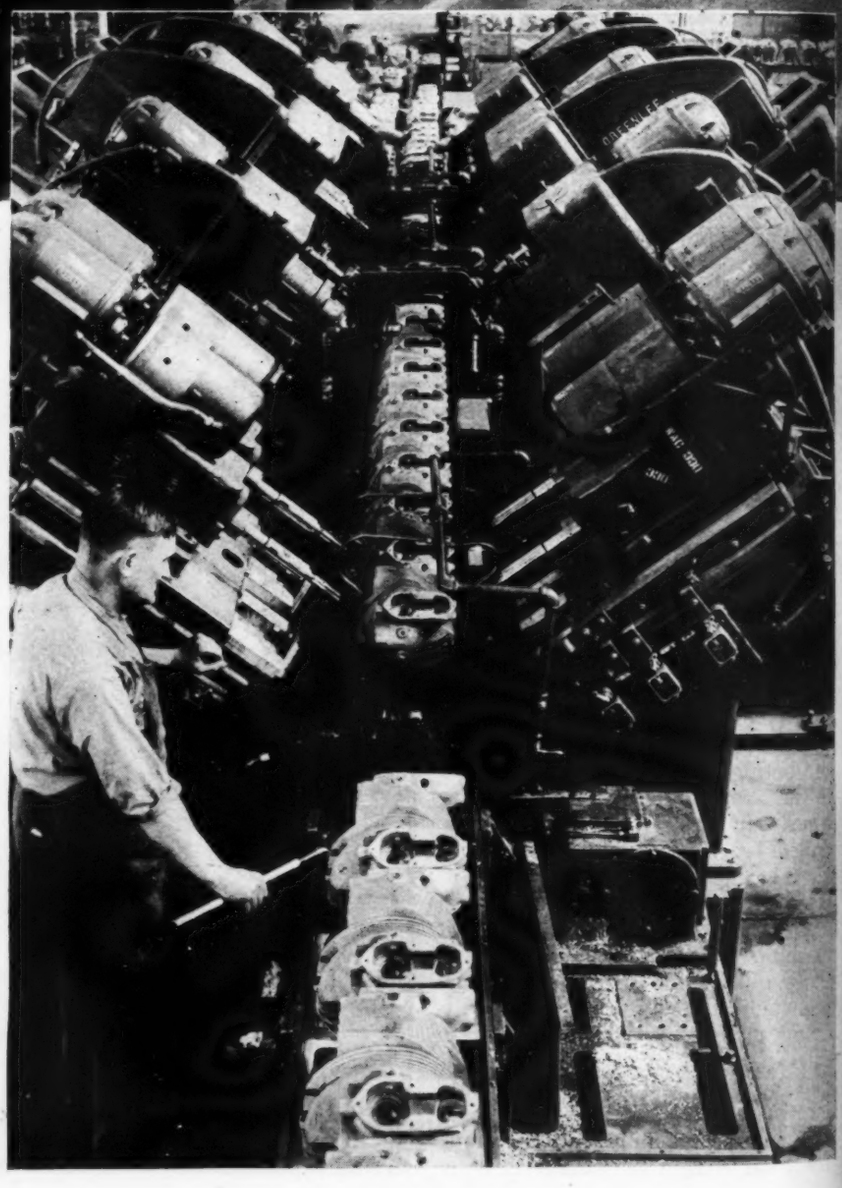
Sixty-four cylinder heads are loaded on racks which carry them through heat-treating furnaces

heads are conveyed to a battery of automatic machine tools for facing and boring the interior, and then pass to the automatic transfer machine on which all holes are automatically drilled, reamed, countersunk, and tapped, and certain surfaces are spot-faced.

Over 150 feet long, this giant machine consists essentially of a series of separate machine tools, all interconnected electrically and hydraulically, and arranged along both sides of an automatic conveyor. The parts are secured to hardened-steel locating plates on which they travel through the machine, and the transfer from station to station is made



Double - track roller conveyor maintains a constant supply of cylinder barrel forgings. Rough parts ride the outer track; machined barrels are placed on an inner track for delivery to the tin-plating machine



Automatic transfer machine completes operations on cylinder heads and discharges parts to a roller conveyor which carries them to grit-blasting machines

by a hydraulic transfer bar which engages the rear edge of the plates and pulls them into position. Accurate location is assured by hydraulically operated dowels which engage in bushings in two corners of the plates.

As the parts emerge from this machine, they are carried through an automatic washing machine, after which the carrier plates are removed and returned to the front of the machine by an overhead conveyor. Cylinder heads are placed on rectangular boards equipped with blocks which fit loosely into the inside. They serve to avoid damage to the fins by collisions, and assure safe, smooth travel along the

Cylinder assemblies arrive via roller conveyor at the automatic grit-blasting machine. After passing through the automatic metallizing machine, they again travel on a roller conveyor to subsequent operations

Fresh from the metallizing machine, cylinder assemblies are again on the march. Note hinged section of conveyor, mounted on casters, to permit opening

roller conveyor that carries them to the subsequent operations.

The 60-lb. alloy steel forgings for the cylinder barrels are moved to the automatic machine tools by a roller conveyor. Here again wooden platforms are used to hold the parts and prevent their tipping over in the spaces between the rollers. At the end of this conveyor is an automatic tin-plating machine into which the barrels are loaded to receive their coating of tin plate. After plating, a roller conveyor carries the parts to a battery of internal grinders on which the tin plate is ground from the inside diameters to prepare them for nitriding. This is a double-track conveyor, the inner track carrying the plated barrels to the grinders while the outer track carries the finished

For the final operations of grinding and honing, overhead conveyors are used. Parts are suspended by a strap that ends in a three-pronged hook. To distinguish between unfinished and finished parts, the former arrive with open ends pointing in one direction; finished parts face the other way

parts to the inspectors. The inner track, of course, terminates at the last machine in the line. After inspection the barrels are loaded on to the hooks of a power-driven chain conveyor which carries them into the heat-treat department.

Other conveyors take the hardened barrels to the finishing operations, and deliver them finally to the point at which they are to be joined to the cylinder heads. This operation is performed by heating the heads in a continuous, conveyor-type, electric furnace to 600 degrees Fahrenheit and then screwing the cold barrel into place.

A second automatic-transfer machine completes the operations on the heads, and discharges the parts to a roller conveyor which carries them to an automatic grit-blasting machine. Here they are thoroughly cleaned to prepare them for the subsequent metallizing operation, which consists of coating them with a sprayed coat of molten aluminum as a protection against corrosion. A second roller conveyor removes the finished parts.

How They Ride

For the final operations of grinding and honing, overhead conveyors are again used, the parts being suspended from the conveyor hooks by a strap terminating in a three-pronged hook. One of the prongs engages in a hole in the flange of the cylinder barrel; the other two are hooked into the rocker boxes. To distinguish readily between finished and unfinished parts traveling on the same conveyor, unfinished parts arrive with the open ends pointing in one direction, finished parts are then replaced on the hooks to face in the opposite direction.

The production assembly line for aircraft engines has been improved by the inclusion of a reciprocating chain-type conveyor mounted in a channel in the floor and equipped with dogs to engage the engine stands. Each operation or group of operations required for assembling an engine has been timed to take exactly so many minutes, and at the end of this period the conveyor automatically moves the engine to the next assembly station. Time and energy formerly consumed in pushing the engines from station to station are thus saved for productive purposes.

Although many miles of conveyors have already been installed in this Wright factory, engineers are planning and laying out new lines to eliminate virtually every manual lifting and carrying operation.

Employers Should Form Unions

Real collective bargaining, in the opinion of this experienced observer, will not attain full bloom until employers, like employees, are organized for purposes of negotiation with labor unions

WARD B. STEVENSON, Public Relations Director, Associated Industries, Minneapolis

A FEW MONTHS AGO the case of the four Little Steel companies versus the United Steel Workers of America was heard by the National War Labor Board. In that hearing each of the companies was represented by its own lawyer, who presented and argued volumes of evidence. The issues involved were practically the same for all four firms; the demands being made by the union were nearly the same for all four. Even the WLB itself treated the four disputes as a single controversy. Only the employers insisted that the four disputes were separate, and treated them as such during the hearings before the board. The Board had to listen to four different employer arguments and read four different employer briefs. That's one way of doing it.

Another Case

Not long after the Little Steel case was disposed of, another, but vastly different, dispute appeared on the board's docket. It was identified as "Twin City Employers of Truck Drivers vs. General Drivers Unions, Locals #544 and #120, International Brotherhood of Teamsters, AFL." The controversy involved not just four but nearly 500 employers—300 in Minneapolis and 200 in St. Paul, and almost all of them are small businessmen without nearly the resources or power of the Little Steel companies. In this case the board heard arguments on behalf of the entire 500 in the same time that it took for the Little Steel case. But imagine the confusion if each of the 500 had insisted that it had to have its interests represented by its own attorney.

The interests of the 500, however, were most ably and fully represented because these employers are members of two employer "unions." The Minneapolis Employers Negotiating Committee, spokesman for the Minneapolis group, is a part of Associated Industries of Minneapolis, and the St. Paul Employers of Truck Drivers, spokesman for the St. Paul group, is a part of the St. Paul Committee on Industrial Relations. It is groups like these two that are tackling the knotty labor problem from an entirely different angle, and are giving management the kind of "unionism" it should have had years ago. If they are successful, they will have solved a problem that has long knitted the brows of conscientious government officials, and that takes its annual toll of the public's patience and funds. Their appearance before the WLB may have marked a milepost in the progress of collective bargaining and labor relations. At least they did the job differently and much more efficiently than the Little Steel companies.

For Equal Power

For entirely too long, employers have regarded their labor problems as strictly company problems, having little in common with the labor problems of other employers—even those in the same industry, dealing with the same unions. It is time American business learned a lesson American labor learned before the turn of the century: *Collective bargaining without equality of bargaining power is collective coercion.* If bargaining power between organized labor and management is to be equalized, employers will have to form unions of their own and bargain through them just as their employees have done. It sounds easy, but there are problems involved which are just as tough as the toughest problems that used to confront labor organizations. Before explaining what employer unions are and what they do, it will be well to examine for a moment the principal reasons employers have been reluctant to organize, even though they have been fighting a losing battle by themselves.

First, businessmen are inherently competitors. Elmer Terwilliger has believed for years that Oscar Onslaught down the street is the most unprincipled dealer in the lumber business. The two have engaged in cutthroat buying and selling for the past 30 years. Elmer has taken the worst of it, and has had to keep on his toes to stay in business. Now, along comes a bright young man from the local employers' association with the suggestion that Terwilliger join with Onslaught and all the others in the retail lumber business for the purpose of negotiations with the union.

Rugged Individualists

Can't you hear Elmer: "I don't need the help of that so-and-so to handle my labor relations. I don't want him to know what wages I pay, nor how my labor contract reads—er—by the way, what is his hourly rate for lumber scalers now?" Our bright young man might just as well spend his time trying to get Bill Terry and Leo Durocher to team up on a double-play combination.

Until employers learn to forget their deep-seated differences, at least long enough to see eye to eye on their mutual problems of labor relations, they cannot and will not satisfactorily solve those problems. As one old-timer put it:

"We can scrap with each other 364 days of the year and thrive on it, but eventually we won't have any business of our own to scrap over, if we don't get together and stand together on the one day of the year when we negotiate our agreement with the union."

Second, because of constant fear of government prosecution on possible restraint-of-trade charges, some employers have been reluctant to negotiate on an industry-wide basis. Of course, legally, there is no foundation for this fear, if no price-fixing or restraint of trade combinations are formed as a result. But business enterprises everywhere have received such a thorough going-over at the hands of some government agencies in the past decade that employers are extremely hesitant to assert their rights or state their side of any controversial issue.

The third and most difficult ob-

(*Continued on page 188*)

Why We Like Women in Ou

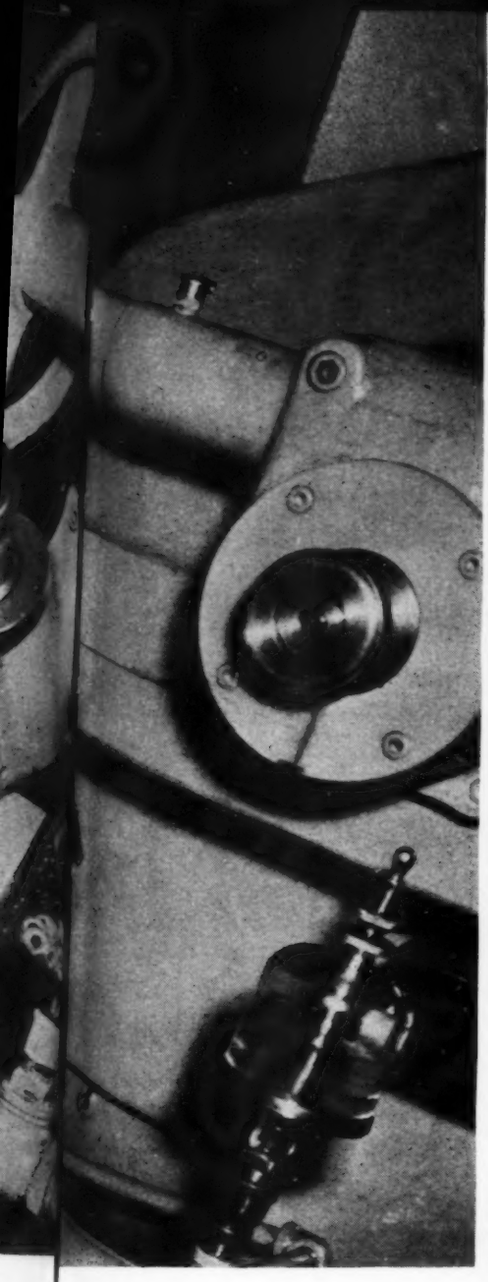
W. G. GUTHRIE, Works Manager, Allison Division, General Motors Corporation, Indianapolis

TEN MONTHS' EXPERIENCE with women has been enough to convince us that they can take over men's jobs and turn out work that meets the unusually exacting requirements of aircraft engine manufacture.

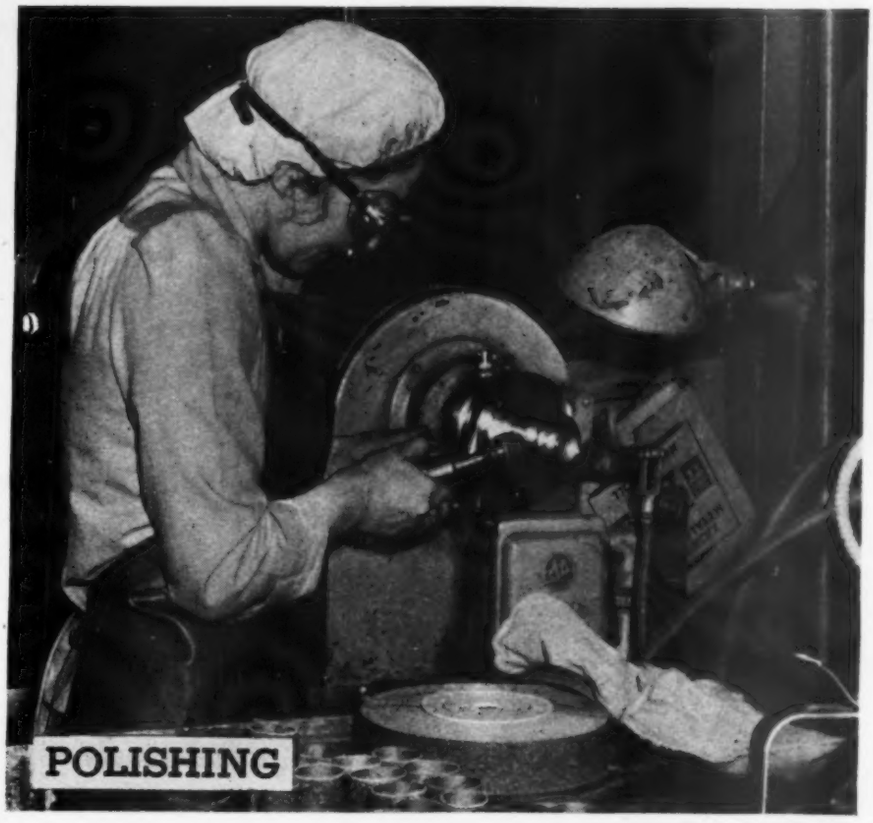
Prior to April 6, 1942, when five women were hired as bearing inspectors, no woman had ever worked in the Allison shop. The factory had been man's domain—and we liked it that way. But employees of draft age were rapidly being inducted into the Army, and we had to find replacements. Women appeared to be the answer.

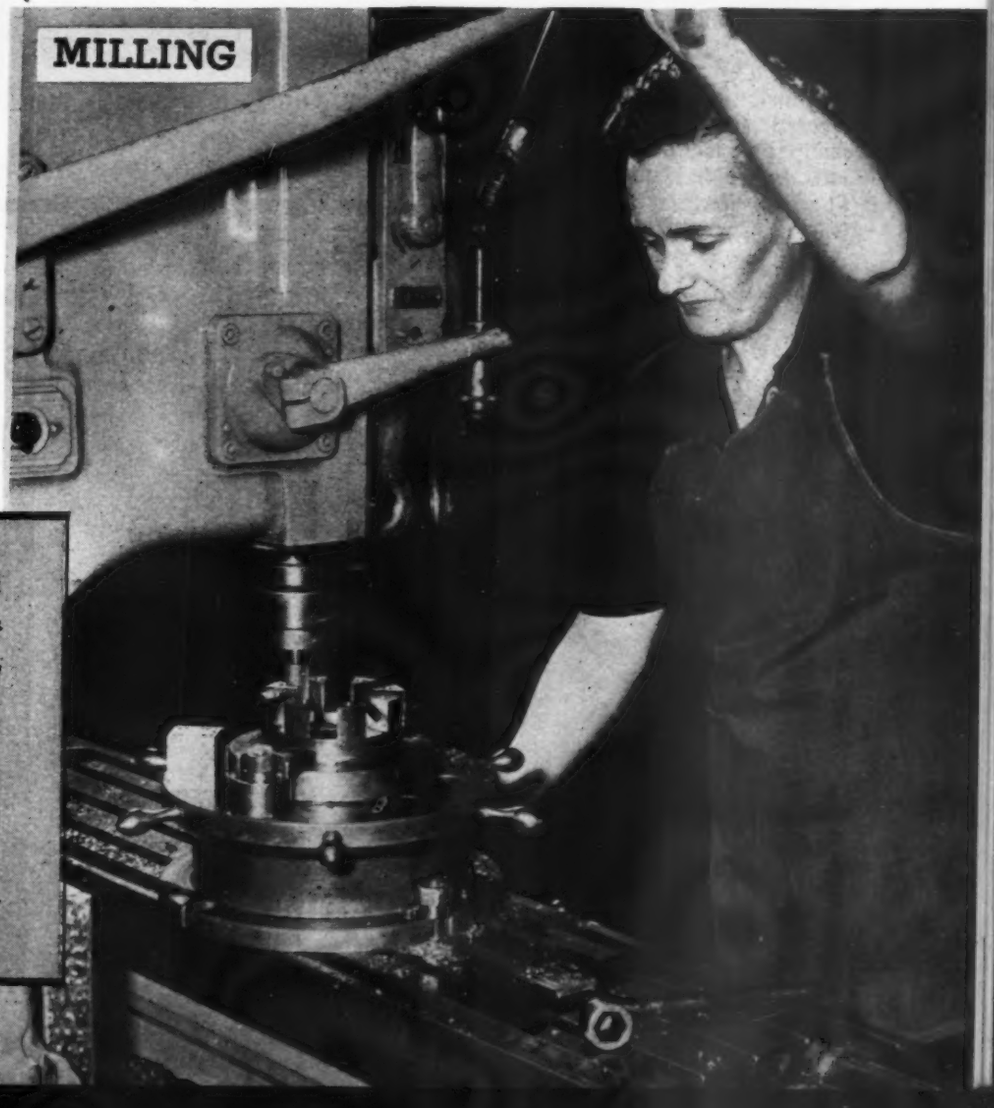
Frankly, it was with some misgivings that we hired the first batch. Today we have close to 3000 women in manufacturing and service operations. We like them—for the reasons hereinafter cited. From now on, in fact, the sky's the limit so far as the employment of women is concerned.

Although a large percent of our female employees in the shop are engaged in receiving, process, and final inspection, we are using them on many other types of work, too. Tool and cutter grinding, packing service and spare parts, burring and filing, tool and gage crib attendance, escort duty, and assembly work are some of the typical jobs they do. At present the only women classed as supervisors are those in an advisory capacity. We do, however, have a number of women who show promise of becoming capable supervisors, given the proper training and experience. Most of our women employees have had no previous factory experience whatsoever, but they



Sky's the limit in the Allison plant, where women are taking over many of the jobs that always used to be labeled "for men only"





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***BEST** statement on women I've seen. I wish every plant operating man might read and profit from Mr. Guthrie's answers to the objections commonly raised to the employment of women on men's jobs—L. C. MORROW*

have proved themselves highly adaptable to this type of work. We feel that the chief reason for this is the fact that they appreciate their limitations in mechanical knowledge and experience and are eager to make good in spite of this handicap. Accordingly, they are very attentive pupils and diligently carry out instructions, even to the most minute details.

Our experience has shown that a woman's traditional lack of knowledge in things mechanical is in most cases an asset rather than a liability. In burring, for instance, we have always had trouble with male employees' not taking the job seriously enough. Burring was just to knock off the ragged edges and make them "look nice"—a trainee or apprentice could do that! Proper burring in the manufacture of precision aircraft engines, however, is very important—far more so than most people realize. Women, informed of the precision nature of this work, take great pains to see that they do it *exactly* as instructed. The result is better, more uniform work, even though they don't know one tool from another when they first start to work.

Our women inspectors are right on the job, too. A good example of the meticulous care they exercise recently occurred in the plant. A new female inspector found the counterbore of an oil pump adapter to be one-sixteenth of an inch oversize. The job-setter and two male inspectors had previously checked and approved the job. This counterbore had never been off before, and they didn't bother to scale it. The girl, however, following instruc-

How Allison Answers the Usual Objections to Women

1. Absent more often than men . . . **No. Women have slightly better attendance records.**

2. More apt to break company rules . . . **No. Generally more conscientious than men.**

3. More emotional when reprimanded . . . **Yes. But not an undesirable trait.**

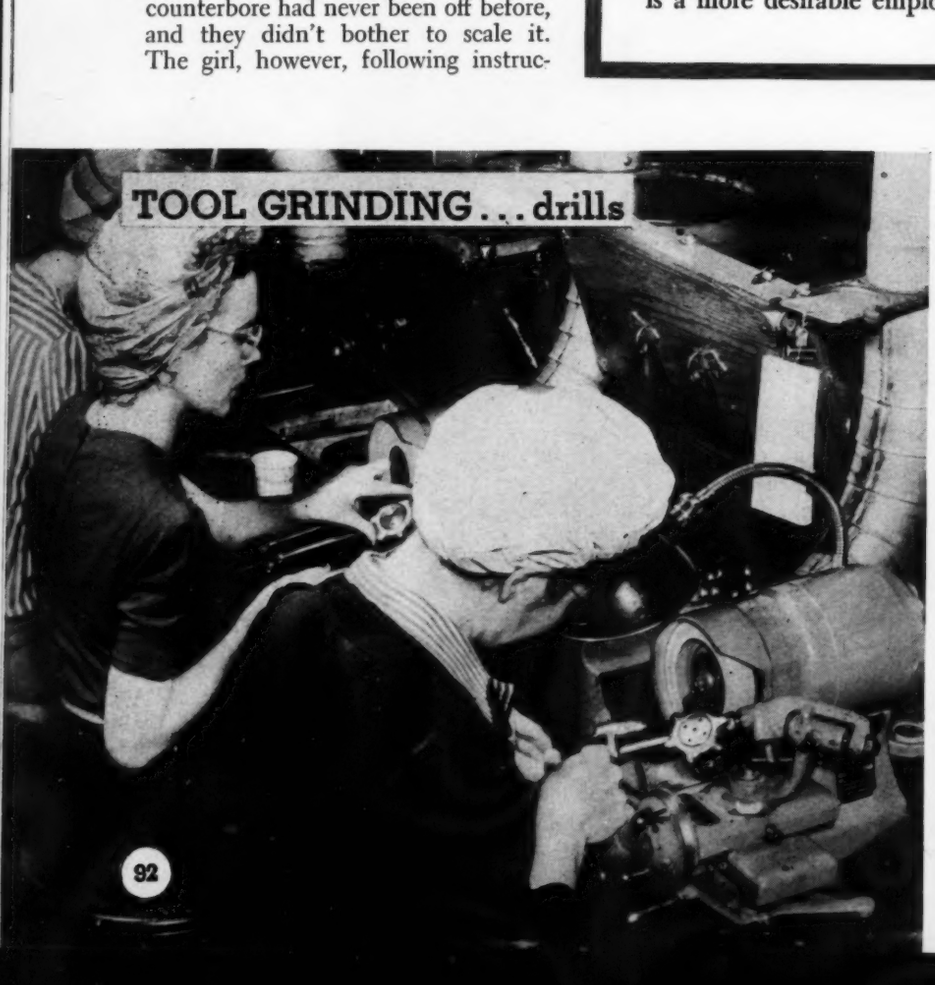
4. Rebellious about wearing unattractive protective clothing . . . **Some are. They are usually the ones Allison does not want anyway.**

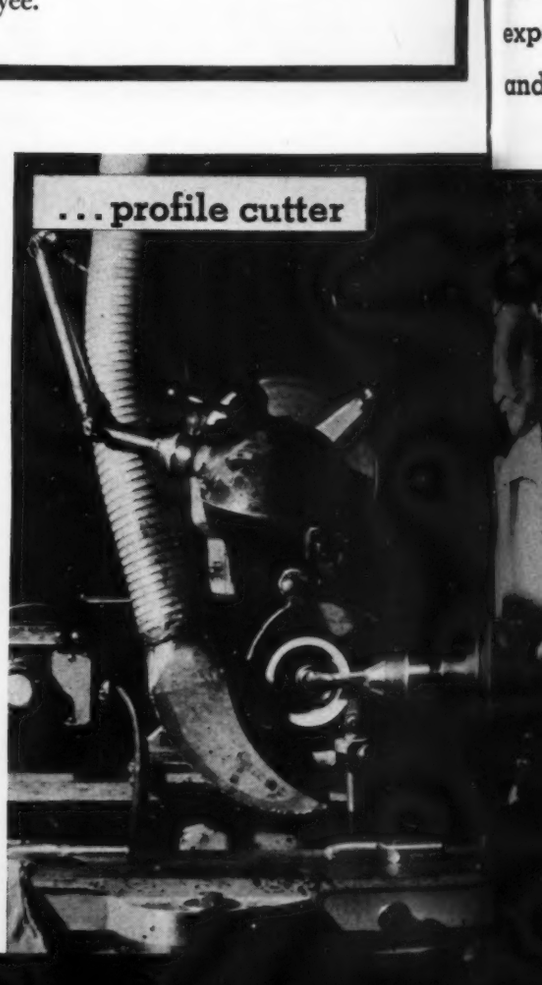
5. Not physically equipped for heavy jobs . . . **Well, why should there be heavy jobs?**

6. Disinclined to be moved from one job to another . . . **No. Eager to move and to learn.**

7. Inclined to fear injury . . . **Aren't we all? In Allison's opinion, an asset.**

8. Often wrapped up in their homes . . . **The woman who is, is a more desirable employee.**





JOBS LIKE THESE are "made to order" for women, even those without previous factory experience. Lack of mechanical knowledge is more than offset by eagerness to learn and ability to follow instructions down to the most minute details

tions implicitly, caught it immediately. She had been instructed to use a scale on this dimension, so she did!

Allison has been careful to hire women with good moral character, and to date we have not been disappointed in any of them. As a whole they have proved level-headed, they learn fast, take their assignments seriously, and want to make good on the job.

In the current arguments for and against women employees, the consensus seems to be that women are:

1. More precise in their work.
2. Better "housekeepers."
3. More patient than men.
4. More dexterous.
5. Eager to learn.
6. Better on repetitive work.
7. More easily led.
8. Often more loyal to the company.

We agree wholeheartedly with the above and we have found also that women are:

1. Often more conscientious and eager to make good.
2. More apt to follow detailed instructions *to the letter*.
3. More appreciative of advancement or increased remuneration.
4. Less likely to loaf on the job.
5. Less inclined toward radicalism or agitation.
6. Inclined to take their work more seriously even though their assignment may be routine or repetitive.
7. More respectful of company property.
8. More economical with tools and supplies.

--We have an answer, too, for the most common objections that have

(*Continued on page 202*)

INSPECTION has always been woman's work, and a large percentage of the women at Allison are inspectors—good ones, too. Light assembly and such jobs as masking for painting are "naturals"

Time Standards by Formula on Job-Order Operations

V. C. STEPHENS, Management Engineer, Corrigan, Osburne, & Wells, Inc., New York

How piece rates can be set on polishing operations and the efficiency of the rate setter increased upwards of 200 percent, is demonstrated in the following experience of a small midwestern plant manufacturing heavy machinery mainly of a special or semi-standardized nature.

The polishing room employed from ten to fourteen men, most of their work being of the job order type. Orders for the same or similar parts recurred at intervals varying from one to six months. As the workers insisted that they be given the same opportunity to earn bonus as the rest of the plant, a time-study man was placed on the job for two months to make them feel that some attempt was being made to meet their request, and, if possible, to find a way of setting up that department economically.

Studies Made

During that time, studies were taken covering all types of materials and shapes. It was found that synthetic standards could be built for some of the pieces processed, such as tubing, disks, flat sheets, and some special parts where the shape remained the same and only the size varied. These, however, covered only about 20 percent of the work polished, and on the remaining portion it would be necessary to spend from four to six hours to get a piecework rate that would be used only three or four times a year and perhaps involve only 24 to 30 piecework hours.

Rather than give the whole thing up as a bad job, and give a 20 percent wage increase in that department to equal piecework earnings, another look was taken at the time studies on the parts not found adaptable to synthetic standards. In comparing time studies on the same material, but of entirely dissimilar size and shape, the following similarities were noted:

1. Handling time on each wheel on each part was constant for that part.

This installation was made by author while an industrial engineer at American Machine & Metals, Inc., E. Moline, Ill.

Polishing and Buffing Formulas and Factors

$R + HX + FG$ = allowed minutes per piece
R = allowed time for roughing wheel less handling
G = allowed time for second wheel less handling
H = allowed handling time
X = number of grades of wheels used for job
F = factor (see tables)

Note: When castings have been machined on polished surfaces, consider machining as roughing operation: use first wheel as basis for times. First wheel = G. Then $FG + HX$ = allowed minutes per piece

Instructions for use:
Time roughing (first) wheel and next succeeding wheel, keeping handling time separate. Determine allowed times for these three elements and apply to formula with factor from table by material and method.

Cast Brass

Finish	Method
High-polish-buffed and color-buffed	Grind 80 Rag.....180 Felt 120 Rag.....Cut Buff 180 Rag.....Color Buff

Rough out with as fine a grade as possible

Roughing Wheel — R	2nd Wheel — G	Factor — F
Grind	80 Rag	4.00
80 Rag	120 Rag	3.44
120 Rag	180 Rag	2.86
180 Rag	180 Felt	2.33
180 Felt	Cut Buff	1.47

Cast Iron

Finish	Method
Fine-polish-colored on 180 felt for plating	Grind 80 Rag.....180 Rag 120 Rag.....180 Felt

Rough out with as fine a grade as possible.

Roughing Wheel — R	2nd Wheel — G	Factor — F
Grind	80 Rag	2.94
80 Rag	120 Rag	2.86
120 Rag	180 Rag	1.96

2. In most of the studies, on dissimilar parts of the same material, polished by the same method, there was a constant ratio between the time for the wheel after the roughing operation (i. e., the second wheel) and the total polishing time for all the wheels except the first wheel. Many of the studies where the times differed from the "standard ratio" were those where the workers complained that the rates were too tight or earnings excessive.

After determining these ratios, so-called general polishing standards were set which, it was found, could be applied to 80 percent of the remaining work. It was now necessary only to take observations on the first two wheels of the operation to set a reasonably accurate piecework rate (plus or minus 5 percent). This required only one to two hours of work per rate set, increasing efficiency of the rate setter from 200 to 300 percent.

The formulas developed, and a partial table of the factors by material and method are shown. Factors have also been determined for five other materials.

Significant Labor Developments

Period surveyed: December 10 to January 10

TREND INDICATORS

Additional Treasury Rulings on Bonus Payments

According to a statement issued by the Commissioner of Internal Revenue, bonus payments within the jurisdiction of the Treasury may be made without approval in two additional situations: (1) Where, before October 3, 1942, the employer had entered into an enforceable contract with the employee to pay him in 1942 a bonus of a specified sum or a bonus calculated in a specified manner, the amount of which was determinable on or before October 3, 1942; or (2) where the bonus or other additional compensation is based on a fixed percentage of an employee's individual sales, provided the bonus rate was fixed before October 3, 1942.

Belo Doctrine Extended

Further extending the application of the Belo doctrine, the Circuit Court of Appeals held valid an employment contract which provided for payment of overtime on the basis of a reduced hourly rate, despite the claim of the employees that the contract was not *bona fide*. (General Mills vs. Williams.)

Belo Doctrine Followed

A circuit Court of Appeals reaffirmed the Belo doctrine that a contract whereby employees' hourly wage was reduced and overtime was paid on the basis of the reduced hourly wage was not in violation of the Wage-Hour Law. As a result, the employees continued to work a 60-hour week and to earn the same weekly wage as they earned before the Act became effective.

Section 18 of the Wage-Hour Law which provides that nothing in the Act shall justify the reduction of wages which exceed the minimum, said the Court, is merely a warning to employers that the Act is not designed to lower wages or raise hours merely because of the minimum or maximum standards established.

The fact that there was no formal written agreement providing for the reduced hourly rate (as in the Belo case) is immaterial. The employees were by "mutual agreement" reemployed at the reduced hourly rate. (White vs. Witwer Grocery Company.)

Scope of Injunction Limited

Under a ruling by the Federal District Court it has been held that where the government sues to enjoin an employer's violation of the Wage-Hour Act, i. e., through stopping the sale of "hot" goods, it cannot secure in the same action wage restitution for the employee. The Court pointed out that the right to such restitution, double the amount as liquidated damages, plus attorney's fees, is exclusively granted to the employee. (Fleming vs. Miller.)

Allowable Deductions From Wages

Deductions may now be made from wages, under the Wage-Hour and Walsh-Healey Acts, for facilities and items such as tools when overtime had been worked, even though the deductions include some profit to the employer. The only limitations on this new policy are that the deduction must not reduce the employee's wages below the required minimum of the Wage-Hour Law, and the purpose and effect of such deductions must not be to evade the overtime requirements of both laws. (Ruling of the Wage-Hour Administrator.)

Blacklist Penalty Imposed

The Secretary of Labor refused to suspend the blacklist penalty against two contractors for having kept false and fictitious wage-hour records. The mere fact that employees participated in the overtime violation because of a desire to increase their earnings was held to be no justification for the offense. The employers could have allowed overtime payable as prescribed by the Public Contracts Act.

Optional Method of Overtime Computation

Under a ruling of the Wage-Hour Administrator employers may use optional methods in computing overtime for employees under the Wage-Hour and Walsh-Healey Acts who receive more than one rate of pay during a work week (i. e., either average hourly rate for the entire week or the hourly or piece rate applicable during the overtime hours). This option, however, is limited to situations in which the employee performs different types of work calling for different rates of pay during the work week, and the employer must indicate which method of computing overtime he has determined to follow.

Enforcement of Wage and Hour Law

A jail sentence plus $8000 toward back wages and a promise to pay an additional $24,000 was one method of enforcing a consent decree.

Held Under the Act

Employees of an air transport company engaged in producing and installing aircraft parts on Army planes on premises apart from the airline base.

Employees of a construction company engaged in extending and enlarging existing runways of a commercial airfield, for use as an Army air base.

Watchman employed by a drilling company to guard oil-well rig, since the occupation is essential to the production of oil. (Robertson vs. Oil Well Drilling Company.)

Employees filling steel shells with explosive charges to be used for blasting purposes in a coal mine.

Office workers and garage maintenance employees working in creameries, held not to be exempt under the Act because not engaged in first processing. (Walling vs. Bridgman Russell Company.)

Employees engaged in the production of sample books for shipment to customers in the producer state who, in turn send the sample books to customers in other states. (Walling vs. Higgins.)

Watchmen furnished by a detective agency to its customers who produce or distribute goods in interstate commerce, since their duties have an essential relationship to such production and distribution.

WAR LABOR BOARD

**Escalator Clauses Limited*

Following its recent decision in the Pyrites Company case, the War Labor Board issued a general order prohibiting the application of escalator clauses which would result in an increase in

(*Continued on page 206*)

* In this and the following classification items marked with an asterisk also are considered to be trend indicators.

MUSIC IN THE PLANT

Westinghouse photograph

1. What Research Proves

MUSIC IN THE SHOP has come to stay. Managements that have had experience with it, like it. So do the workers who listen to it. Today, in some hundreds of plants, it has become an important technique of the war production drive. Tomorrow, based on what we know about music today, we may reasonably expect to see it one of management's most useful tools.

Workers like music for perfectly obvious reasons. It does things to them, gives them a lift. This is nothing new. Music and work go together. Man has always liked to sing at his work—and did, until the industrial system made it impracticable. This, perhaps, has been one of the few disadvantages of the industrial system as we have known it. Thanks to radio and modern electronic distribution, it has been overcome.

So workers like music. We can be sure of that. In no plant where it has been introduced have any considerable number of employees objected to it. On the contrary, surveys have shown almost universal approval. And in many a plant where music has been the order of the day, it has been recorded that immediate, loud, and prolonged protests followed its temporary discontinuance. Why does management like music? Because, presumably, it improves morale—builds what we think of today as "the will to win." Does it not follow logically that better morale means better work, more output?

Could be. But until recently such conclusions were based on the most superficial kind of observation. Nobody in industry or out knew how

good music was, what it did to workers. Management had a hunch—that was all—that music in the shop increased production.

Today the picture has changed. Facts have supplanted hunches. The evidence is still inconclusive. But the data are indicative.

Straws From Britcin

From Britain came the first straws that indicated which way the wind was blowing. With the war, sound installations became mandatory in British factories—primarily for use in air raids, not only to aid in orderly withdrawal to shelters, but also to save vital man-hours by not calling out employees until enemy planes were only a few minutes away. In England, as in America, when the sound system goes in, music usually follows. There are no data to show how many British plants use music, but according to all the evidence more do than do not.

At any rate, British management and British workers were unanimous in their approval. But, as always, the conviction and statements that the broadcasting of music actually increased production could be largely classified as wishful thinking.

Then at last came proof—of a sort, at least—with the publication of a report* by the Medical Research Council of the Industrial Health Research Board.

"Music," to quote briefly, "is an effective antidote to boredom. During the time when music was played, the increase in output varied from 6.2 to 11.3 percent, while the total daily output showed an increase of 2.6 to 6 percent. Different types of music were found to have slightly different effects upon the output."

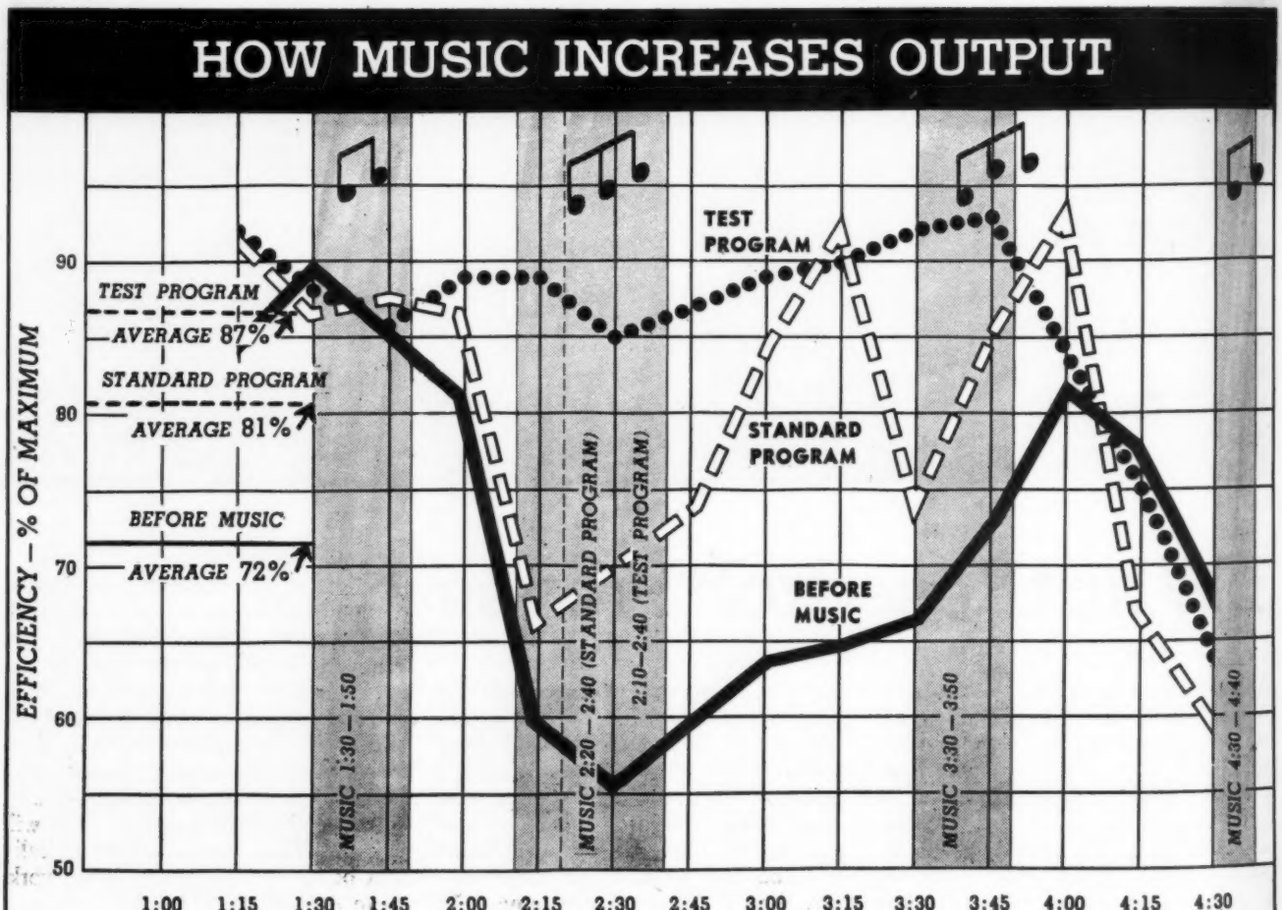
Was not this precisely the kind of proof industry was looking for? The studies were thorough. There could be no question of their authenticity. Trouble was, the only group of workers studied was a group of girls in a chocolate factory. Could one be sure of the same kind of results in a woollen mill, a machine shop, a shipyard? We still do not have the whole answer, but we do have some of the pieces—and some very considerable pieces, at that—thanks to studies made by Harold Burris-Meyer of Stevens Institute of Technology, Hoboken, N. J., with the cooperation of numerous industries and of two organizations dealing with music-distribution systems and music libraries, Muzak, Inc., New York, and RCA Manufacturing Company, Camden, N. J.

* "Fatigue and Boredom in Repetitive Work," S. Wyatt and J. N. Langdon, Printed by His Majesty's Stationery Office, London.

Why Music

"Our interest," says Burris-Meyer, "is in emotional control. We are interested in exerting it directly, by emotional stimulus, and by inducing physiological change as the basis for emotion.

"The ends to be achieved by emotional control are in industry obviously to suit the man to his task, to give the work the status of a *metier*, to make it for the man, not what he lives by, not that which produces the pay envelope, but a major



Three curves from data compiled from an experiment in programming made by Harold Burris-Meyer and his associates show output (1) before music, (2) after installing a standard program of music, and (3) after introducing a special test program designed to level out the 2:15 dip—which it certainly did

At Davis & Geck, no data to show increases in output since music was installed. But records do show that unnecessary trips to the medical department have been virtually eliminated

element in living. If that can be done, even if only in part, the work improves and the employee likes it. If you have control of the stimulus, if you can define it in terms of intensity, spectrum, and cyclic quality, and then measure the rate and quality of production, lateness, early departure, absences, accidents, and any discoverable indexes of employee morale, without the worker's knowledge that he is a subject, you have a valuable technique for the study of emotional control and can, incidentally, find out what music in industry is good for, and how good it is . . .

"Accordingly we proceeded to study existing musical programs in factories and then to assemble programs for specific purposes . . . We have been able only to employ a sampling technique. We have not been able to study accident rates. We have not yet been able to establish or evaluate satisfactory indexes of employee morale. We have a lot of ideas about such indexes, but no figures at the moment. The data we have are indicative. They are not sufficient to form the basis of unassailable conclusions, but we believe they show which way the wind blows."

Burris-Meyer and his associates set about to measure the most obvious thing—*does music in the factory influence the production rate?* Data were "taken under controlled conditions. No figures were used where there were significant changes in weather (temperature, humidity, light), or ventilation, or noise, from day to day; or where there was other than normal labor turnover, or any labor-management quarrel; or where there was any plant change in terms of machine arrangement or color, or variation in process or product."

In short, studies were made under exactly similar conditions *before* and *after* music was installed. For example, before-and-after curves to show unit output per worker were plotted for a group of sixteen experienced employees. In both cases, curves were erratic, but the average output for the day of 46.5 units per employee per quarter-hour without music was increased to 49.6 units with music—an increase of better than 6 percent. In more than 75 percent of the measurements in all factories studied, total production was greater with music than without.

For a group of approximately 100

Faces brighten when the music is on at Cluett, Peabody & Company. Questionnaires used by this concern have left no doubt as to the preference of workers in the workrooms reached by the system. Far right, the studio where the music originates. Not only music, but also important events like the World Series are broadcast

employees of all degrees of experience, total weekly production per hundred man-hours for two typical weeks, one without and one with music, showed a difference of 11.4 percent. And a third study, based on a week before music and covering eight weeks after music was installed, showed increases ranging from 3.6 to 14.1 percent in seven of the eight weeks. The third week, for some unaccountable reason, showed a decrease, but it was only 1 percent. Average increase over the eight weeks was 7.8 percent. Employees were on piecework, so weekly pay envelopes for the seven good weeks were pleasingly plumper.

An operation studied in another factory was one requiring a high degree of manual dexterity and a sense of timing. Employees were on piecework. For three weeks before music, average output per man-hour ran 270; for three weeks after music, 281—an increase of 4.07 percent.

Saves Man-Hours

Not only did the studies indicate that music makes the work go faster, but the data also showed that it may have a beneficial effect on Monday absences and early departures. In a typical case, employees were on piecework and were in the habit of going home early when they got tired. Here, in two sample weeks, one without and the other with music, the percentages of man-hours lost for this reason decreased from an average of 2.52 to 0.845. Similarly, the percentage of Monday morning absenteeism dropped from a 4-week average of 22.75 before music to 2.85 after.

"Programming," according to the Burris-Meyer study, "is of great importance. It is now practiced in conformity with theatrical principles plus observation and experience. There is considerable divergence of opinion among those who arrange programs on the question of the number and length of playing periods; the relative values of associative and nonassociative music; the value of popular jitterbug versus classical music; the relative value of vocals and instrumental music. It is generally accepted practice, however, to limit playing time to not more than 2½ hours per day, in periods of 12 to 20 minutes. Marches for opening, and marches and popular foxtrots for change of shift or closing time, are most generally preferred. Music during the last 20 minutes of a work period is generally not employed since it might be taken as a signal to get ready to go home.

"Special radio programs, especially those planned for music in industry, are occasionally used. 'Deep in the Heart of Texas' is out. It stops all work in the United States and in England because, naturally enough, the employees feel obliged to drop all work to join in the hand clapping in the chorus. The 'Strip Polka' is shunned for obvious reasons. Hymns are said to be in considerable demand on Sunday in some factories, though it has been observed elsewhere that hymns can stop work about as fast as a fire gong.

"Luncheon periods are considered the most flexible in programming and often carry recorded messages to the folks back home from the men in the service, bond sales talks, news reports, salon music alleged to aid digestion, hot numbers for the jitterbugs, request numbers, etc. Some factories ban vocals during work periods; others like them."

One experiment was undertaken to demonstrate that a musical program planned for a specific purpose can accomplish that purpose. The factory had had music for six months. So far as the musical program could be evaluated, it was better than average. For production figures before music it was necessary to go back to records kept by the company a year prior to the installation of the sound system. The figure herewith shows the resulting curve of efficiency, averaging 72 percent of maximum. As the other curves show, there was an increase to 81 percent with the installation of music) to 87 percent with the planned-test musical program.

Fixed the 2:15 Dip

Examination of the production curve after music was installed shows a fairly uniform pattern with a sharp dip coming at about 2.15 p.m. The program was planned with the sole purpose of knocking the bottom off the 2.15 dip. The curve shows what happened to it, from which Burris-Meyer concludes that "programming must be undertaken for the factory, if not for the specific operation. Fatigue curves vary in shape and amplitude, and it is difficult to find one remedy for dips occurring at different times in different operations. We have, at least, established the fact that the remedy exists and the technique for employing it is in hand."

2. What Industry Says

FROM THE FOREGOING SUMMARY of the Stevens study of music in industry, we may fairly assume that music, in some cases at least, does the right sort of things to workers and to output. The authors of that study are the first to point out, however, that the evidence is not conclusive, that the results to date serve only to show which way the wind is blowing.

In other words, the data now available are too meager for us to state categorically that music increases production. Much in the way of research remains to be done. Until it is, we shall have to rely, for our evaluation of music in the plant, upon the experiences and opinions of those who have used it. In the following pages, therefore, are found case studies from companies whose use of music ranges all the way from many years to a couple of months.

Cluett, Peabody

Most users have relied on personal observation to determine the reaction of employees to music in the shops. At Cluett, Peabody & Company, Troy, N. Y., on the other hand, an actual check was made in the thirteen work sections where music was being played. The result was overwhelmingly—679 to 36—in favor of music. The fairly large number, 136, who failed to reply, may be accounted for by the fact that, in one department, the music had been only partially installed, while in another department—maintenance—a great many of the men were working in other parts of the plant where music was not being played.

"Music was not installed," testifies R. O. Kennedy, vice-president "with the thought that it would have any immediate and direct effect upon production, but rather for the purpose of reducing or alleviating the monotony of more or less repetitive operations. We have not attempted to establish the direct effects upon output, but it seems reasonable to assume that production is favored by anything that lessens fatigue and makes both work and workplace more enjoyable."

Music was first installed early in 1940—originally as a test installation and then in a few departments. Employee response from those departments has been so favorable, and employee requests from other departments were so insistent, that the service is now available in practically all sections of the plant except those in which the unavoidable noise of machine operations makes installation inadvisable.

The music originates from a control studio where it is produced from transcriptions furnished monthly by the company that made the installation. The music library now contains upwards of 1000 selections.

The system is operated by a clerk in the office who gives about half of her time to this work. It takes some 45 minutes, for instance, to work up her daily program, and the balance of the four hours devoted to music is spent running the turntable and keeping up her ledger. Records are entered in the latter by class of music, name of band, and time required to play. The operator checks dates played so that she won't play a given record oftener than once a week—unless it is a "request" number. Employees make requests. There is no formal system. Requests are either made direct or forwarded to the music director through the supervisors. There is a microphone by means of which birthdays and anniversaries can be announced—prior to playing "Happy Birthday" or the "Anniversary Waltz."

There is a 15-min. period of recorded music every morning immediately preceding the commencement of work at 8 o'clock, with two addi-

tional periods in the morning for all but one department, which has three. And there are three periods in the afternoon. Periods are either 15 or 20 minutes long.

From 10:55 to 11 a.m. and from 3:50 to 3:55 p. m., a radio news broadcast from the local station, WTRY, is relayed over the system. Occasionally special events are broadcast, like World Series games. And once or twice a speech of the President's has been broadcast. The system is not regularly used for paging.

Sylvania Electric

Music can no longer be regarded as an experiment when the user, like Sylvania Electric Products, Inc., has had it for ten years or more.

"Music is much more effective," reports G. E. Morse of Sylvania's industrial relations department, "where operations are repetitive and, in the case of experienced workers, almost automatic, than in the office or engineering department.

"It should be made clear, however that music has no measurable effect upon production—other than might be expected from an increase in the general morale level. The real value of the music is its ability to break up the monotony, which has become more of a problem with the longer work periods made necessary by the war.

"Our employees value the music very highly and always look forward to a resumption of the records when the system is shut down for repair. They are encouraged to make requests from the company's library of records, and also bring in their own. The most satisfactory plan, we have found, is to play a series of three or four records once every half-hour. No standard pattern is followed, although the workers seem to prefer popular music of the 'sweet swing' type. Heavy music, music that creates a definite 'mood,' or records that attempt to 'tell a story' are not so acceptable. Some specialized tunes have been found effective, such as 'Any Bonds Today' on payday."

Lorentzen Hardware

Another company that has questionnaired employees is Lorentzen Hardware Manufacturing Corporation, New York, which has used wired music for a number of years.

Only 32 people were questioned, but all 32 said they liked the music and wanted it continued. Eleven did not reply to the question, "Does the music help you with your work?" But 21 said it did. Their reasons included such comments as:

"Listening to the music my fingers automatically start to work more rapidly."

"Breaks the monotony."

"Makes the work more pleasant. Also you can work with the rhythm."

"It makes the day appear shorter. keeps you awake."

"The time goes quicker, and the job I am doing seems easier."

"I don't think of the time. The day goes faster. So does the work."

"During the latter part of the day you are inclined to feel tired, and the faster tempo of music seems to give more energy to work."

"The music adds variety to a day of work. It lightens an imaginary burden, helps us keep in time with production instead of slowing up."

"It adds rhythm to my work and calms the nerves."

"It keeps my mind relaxed."

As to dance or classical music, 9 wanted it 50-50; 12 preferred three-quarters dance and one-quarter classical; and 11 the other way around.

Music at Bristol-Myers followed the installation of a public address system. It's run by the switchboard operator with the help of a member of the office force who loads the record changer

Norden

Far more decided in their preferences are employees at Carl L. Norden, Inc., New York, manufacturers of the famous bombsights used by our fliers. Says John Purcell, director of public relations:

"We have been using music in our plant for several months and have found it very effective in counteracting employee fatigue, particularly in the late afternoon. The music is played approximately 3 hours out of 8, for 15 minutes at a time.

"Our operation is one that calls for extremely high precision and consequently we play no vocal numbers as they might prove distracting. Fully 90 percent of the requests are for classical music, with a stirring march or two appreciated toward the close of the day."

Bristol-Myers

Enthusiastic about his company's experience with music, but somewhere in the doubtful column as to its ability to increase production, is R. S. Edmondson, employment manager of the Bristol-Myers Company, Hillside, N. J.

"Music with us is merely a by-product," he testifies. "We installed our sound system primarily as an aid to finding busy executives and other key men when away from their desks or stations. We tried music because we thought the employees would like it. Sure enough, they do—90 percent of them, anyway.

"The production lines where we package Ipana, Sal Hepatica, and

other B-M products are automatic. The machines set the pace. Much of the work is repetitive, and music in our opinion breaks the monotony and relieves the tension. But if there is any increase in production, it is purely incidental. The main thing is, employees like the music. If they ask for it, that is enough for us. And ask for it they do, as we very well learn all over again on each of the rare occasions when the system is down."

The Bristol-Myers system, now nearly two years old, has 165 loudspeakers to carry messages and music to every corner of the plant. The telephone operator manipulates the system at her switchboard through a master control cabinet which permits the music to be fed into the loudspeaker circuits. Music originates from an automatic record changer which plays ten records at a single loading. This player is operated by a member of the office staff.

Bristol-Myers starts the morning with 45 minutes of music and winds up the afternoon with a similar session. The only other time music is played is during the three half-hour lunch periods from 11:30 a. m. to 1 p. m. Programs include popular and swing music, with some classical and few vocal selections.

Davis & Geck

For more tangible evidence as to the effect of music on production, one may go to Davis & Geck, Inc., Brooklyn, N. Y., world's largest manufacturers of surgical sutures, now working 24 hours a day to keep our armed services and hospitals supplied.

Work here is of the highly skilled, repetitive type, and 90 percent of the employees are women. Music was installed only three months ago, but has been in use long enough for the company doctor to note that the heavy traffic to the medical department along about 10.30 to 11 a. m. has slowed down to a mere trickle. Most of these visits were occasioned by headaches and minor ailments, many of them imaginary. Now all calls are legitimate.

"Better morale may certainly be cited as a major benefit of music in the plant," says C. C. Adams, assistant general manager. "I believe it sustains production. It certainly cuts down on the conversation, and too much conversation unquestionably reduces output. We have also discovered that the music has eliminated most of the unnecessary trips to restrooms."

A typical day's program at Davis & Geck, showing rigid adherence to a carefully planned schedule, is reproduced herewith. Programs are classified as "opening," "pre-fatigue," "fatigue," "luncheon," and "special," and are arranged accordingly. The same program is used on the first and second shifts. Since it is impracticable to provide an operator for the third shift, a radio program, "Say It With Music," planned for industrial use and available from 1 to 6.55 a.m., is substituted for the third shift and has proved very satisfactory.

Running the system is a part-time job for a girl in the office. Records are cataloged and filed, so that she can make quick work of arranging the day's program. One of the girls on the night force operates the equipment during the second shift.

There is a request box on each of the three floors served by music, and many requests are received. Unlike many users, this company sees no objection to vocals as a class and finds no evidence that employees stop to listen to the words.

Musical PROGRAM

Tuesday • January 12, 1943

7:45 – 8 A.M. 4:30 – 4:45 P.M.

O-20B—Tavern
O-21B—Dear Old Pal of Mine
O-22B—Giddyup Horsie
O-23B—Solid Men to the Front
O-24B—Skoda

8:45 – 9 A.M. 5:30 – 5:45 P.M.

F-15A—Caminito
F-16A—Yours Is My Heart Alone
F-17A—You and You
F-18A—Gypsy Baron
F-19A—I'm Gettin' Sentimental

9:45 – 10:09 A.M. 7 – 7:24 P.M.

F-20A—Gavotte
F-21A—Blue Danube
F-22A—Don't Tell a Lie About Me
F-23A—Invitation to the Waltz
F-24A—Blue Seashells
F-25A—Vienna Beauties
F-26A—Marie
F-27A—Come Back to Sorrento

11:30 – 12 Noon 8:30 – 9 P.M.

L-15B—Poor Little Rich Girl
L-16B—Stout Hearted Men
L-17B—Nagasaki
L-18B—Bendemeer's Stream
L-19B—King for a Day
F-28A—Embraceable You
F-29A—Look for the Silver Lining
F-30A—That Old Gang of Mine
F-31A—Too Beautiful to Last
F-32A—En el Rancho Grande

1 – 1:15 P.M. 10 – 10:15 P.M.

F-33A—"Show Boat" Medley
F-34A—Wine, Women and Song
F-35A—Sweetheart of Sigma Chi
F-36A—I'll Follow My Secret Heart
F-37A—Angeline

2:15 – 2:39 P.M. 11:15 – 11:39 P.M.

F-38A—Yes, My Darling Daughter
F-39A—Fair Hawaii
F-40A—Cielito Lindo
F-41A—Bolero (Ravel)
F-42A—Sweethearts
F-43A—La Rosita
F-44A—Johnny Doughboy
F-45A—Annabelle

Planned music gets the best results—and Davis & Geck, like most plants using music, plans programs with care. Code enables music director to work up her programs in quickest possible time

SKF Industries

Mixing music with the production of ball and roller bearings has, in the opinion of plant officials at SKF Industries, Inc., Philadelphia, brought about a definite upward swing in morale and output.

Wired music was given a trial in June, 1942, in the final inspection department of the Atlas Ball Division where girls concentrate closely while inspecting highly polished steel balls and rollers. Played 15 minutes out of each hour during the day, the music began with one or two peppy or patriotic tunes, slowed down to rhythmic waltzes at noon, and increased tempo in the later afternoon. All music was instrumental because it was thought that vocal music might detract attention.

Employees were soon staying at their work for longer periods, and many commented on how the music helped to relieve the nervous tension. When the trial period was ended, they had no difficulty prevailing upon the management to have the system permanently installed. It has since been extended to assembling, capping and packing, 3-Star bearing, final inspection, and self-aligning bearing departments.

Fellows Gear Shaper

Music is broadcast to workers on a round-the-clock schedule at the Fellows Gear Shaper Company, Spring-

Fellows Gear Shaper Company maintains a complete broadcasting studio, with music on a round-the-clock schedule. Here, at the microphone, Billy B. Van, manager of the human relations division

field, Vt., where a regular soundproofed studio has been set up.

"We also broadcast birthday greetings and a welcome to new workers, both men and women," to quote Billy B. Van, manager of the human relations division. "We send out announcements of newcomers (little babies) in the families of our employees. Our lost-and-found department announcements have been the means of returning many mislaid tools and such other articles as pocketbooks, identification cards, ration books, hats, gloves, overcoats. One fellow even lost a shotgun and we found it for him.

"One man lost a bass fiddle, but we have not been able to locate that yet. We think he may have eaten it."

From which it may be adduced that a good time is had by all in this plant. Marches and popular songs are broadcast from 7 to 7:15 a.m. while the shifts are changing. At 10 a.m. a 15-min. period of up-to-the-minute news from one of the major newscasters keeps workers informed. A mixture of news and music is broadcast from 12 to 12:30 p.m. Special announcements regarding the work, the recreational program, etc., are heard from 12:30 to 1, followed by a half-hour of recorded music. There is another news period at 4 o'clock—and from 6:50 to 7:15 p.m. military marches once more mark the changing shifts. The same program is repeated for the workers on the night shift.

For Draftsmen

Although most concerns have hesitated to include drafting rooms in their plans for music, not so Chemical Construction Corporation, contracting chemical engineers of New York City. When this company's staff grew from 200 to more than 400 draftsmen in a few months' time, and working hours increased from 38 to 53 per week, it was suggested that music be installed to relieve the tension and weariness caused by the long hours the men were putting in.

"The system was originally installed on approval only," relates P. B. Rauschelbach, personnel director, "because we did not know what the reaction of highly skilled, technical men would be. It met with instantaneous success, however, and a few weeks afterwards we took an individual poll of our employees. The results were amazing—98 percent voted in favor of continuing the music.

"In order that the music may not become monotonous, we have a set schedule, starting with martial music for the first 15 minutes of the working day. Thereafter, for 15 minutes out of every hour, recordings are transmitted up until 3.30 p.m., at which time the schedule calls for 15 minutes on and 15 off, until 9 p.m.

"Numerous favorable comments have been received from the men."

In the Office

Most companies seem to agree that music in the office is not so good, although it is probable that few of them have given it more than a quick try. It is therefore of real interest and in the nature of a major contribution to our knowledge of music in industry to have testimony in favor of music for certain classes of office workers. It comes from The Research Institute of America, Inc., New York, which is using music successfully in most of its office departments.

"We have found," says Lucille Berry Graff of the personnel department, "that music definitely eliminates much of the undercurrent of noise caused by conversation and business machines. It also provides a 'pick-up' for jangled nerves and fatigue during the last hours of the working day. More important—it helps keep an employee 'sold' on his job. We find, for instance, since the installation of music in the filing department we have less turnover. It appears that routine tasks have become less monotonous.

"Our arrangement provides for wired music. Light classical and popular selections are played for 10 minutes of each hour. It is interesting to note that the volume must be kept loud enough so that the music can be heard distinctly or it is apt to become annoying to the individual and interrupt his work.

"Working with music has been most successful in office departments doing such routine work as typing, billing, and filing. Where creative work is done, however, as in our editorial department, it proved to be a disturbing element."

Check These Points When Making a New Layout

When problems press close and time is short, it is easy to forget a detail or two. Here is a handy list of points that the layout man should not overlook

J. S. HEAL, Production Engineer, Lockheed Overseas Corporation, New York

1. **Watch dimensions** on architect's drawings. It is seldom that all the dimensions shown on the drawing check exactly with the building. The differences may be slight, but accurate layout situations may arise which make a few feet or a few inches extremely important.

2. **Collect complete information,** where possible, on (a) sewers and drains; (b) main water lines and steam lines; (c) main air lines; (d) main power lines; and get a complete set of architect's drawings. It is embarrassing to locate a building and find that the foundation falls directly over a sewer line. Therefore, make an actual site inspection to determine if utilities are exactly as shown on the print.

3. **Measure every detail** of a building before making the building outline for layout purposes. Much time can be lost by making the layout and finding that columns, windows, and doors are not where they should be.

4. **Assign a building inspector** to remain right on the job when buildings are being constructed, to make sure that the building foundation, floor, and machine pits or foundations are correctly located. Buildings often go up so quickly that if someone is not right on hand to solve problems as they arise, a considerable amount of concrete breaking or rebuilding must be done later.

5. **Determine the strength** of the building trusses in order to know exactly where monorails or cranes may be installed.

6. **Find out** the approximate production for which the plant is to be laid out before beginning the layout.

7. **Take steps,** where ground conditions are wet or extremely rough, to pave the roads, or at least fix them, before heavy building traffic is forced to pass over them.

8. **Double check** to make sure that air compressors, steam plants, power lines, sewers, and drains have sufficient capacity to handle requirements.

9. **Find out** whether utilities are to be brought in overhead or under the floor. If floors are being laid, make sure conduit is laid in place correctly and on time.

10. **Work far enough ahead** of the contractor so that all plans are in his hands long enough in advance to make any changes or answer any questions that may arise.

11. **Analyze the requirements** of all departments to determine the best type of handling equipment to take care of all production needs. In other words, an analysis of the materials handling problem should be made at this time to determine the truck, trackless train, conveyor, crane, and hoist equipment required.

12. **Check to make sure** that adequate stockrooms are provided for a sufficient supply of all parts near the place they will be used. On the other hand, make equally sure that too much storage room is not allowed, which would rob space for production.

13. **List all functions** or shops involved, with the aproximate amount of floor area required for each.

14. **Make a small-scale layout** of the entire site, upon which the general interdepartmental flow of materials can be worked out.

15. **Apportion building areas** for the various functions, analyzing the flow of work that will be traveling from one shop to another.

16. **Plan buildings** so that functions not requiring high ceilings are located where they do not take up space that could be used to better advantage for larger assembly work.

17. **Include inspection** as a part of the production line, where possible, forcing it to move right along with production.

18. **Lay main aisles quickly** to insure access from one building to another. If this is not done before actual layout is begun, it becomes much more difficult to do later.

19. **Take each function** separately and makeup one-eighth scale or larger drawings.

20. **Make a flow chart** before attempting any layout work, where the nature of the product requires a sequence of operations.

21. **Secure standard-time information** as far as possible in advance, in order to determine accurately the number of stations required in an assembly line, or the number of a given type of machine required to meet the schedule.

22. **Determine whether spot** or progressive assembly is to be used, if the sequence of operation is in an assembly department.

23. **List operations** where there is a sequence. They should be carefully enumerated, eliminating any that are unnecessary. Times, either from time study or from supervisor estimates, should be secured to balance layout.

24. **Group similar machines** in job shops, where shop operations do not follow in sequence. The customary procedure is to place the lathes, drills, mills, shapers in separate groups.

25. **Make paper templets** of cross-section paper for each machine requiring floor space, showing location of operator and power supply connection. Don't be lazy, make templets! Even where very small amounts of equipment must be located, it is hard to visualize several machines in five or six different positions. In the long run, much time can be saved by not

(*Continued on page 216*)

Canadian Plant Halves Willful Absenteeism

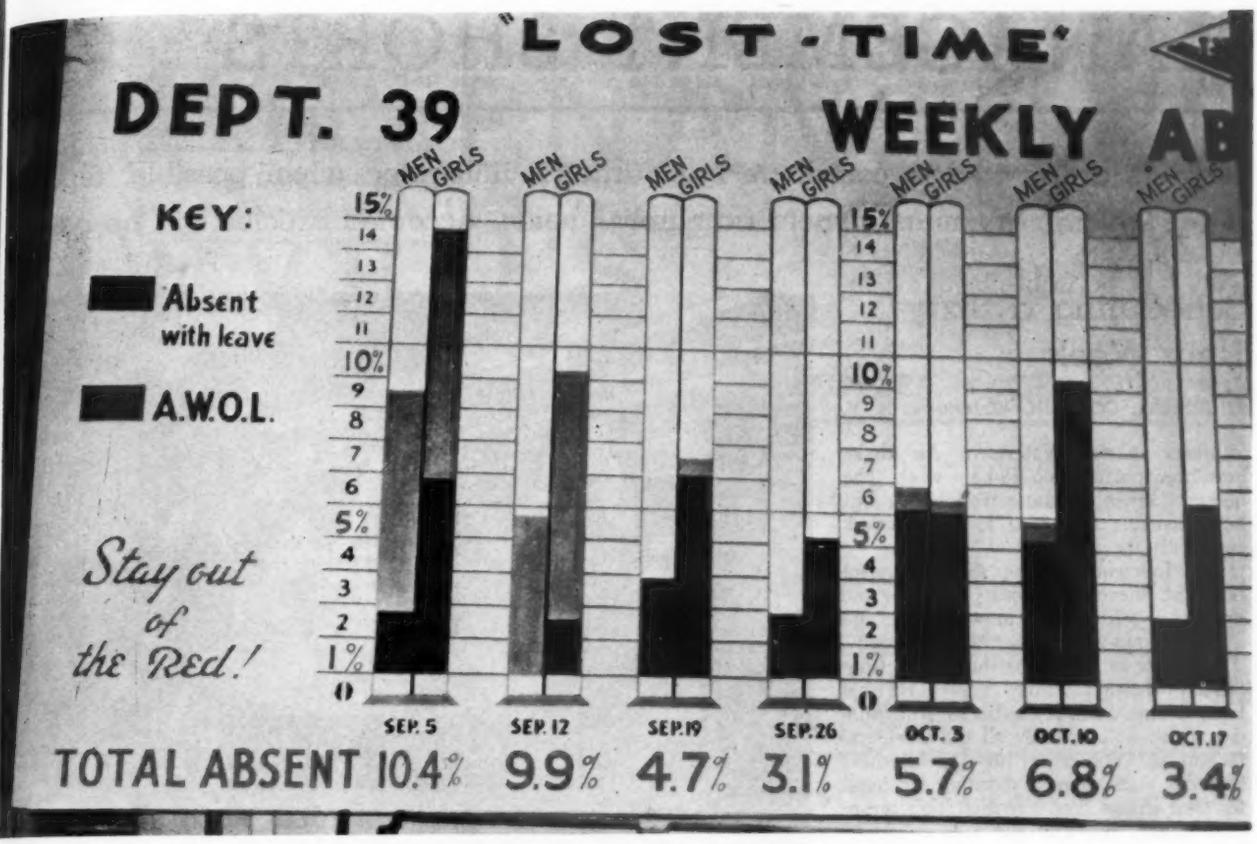
"Subtle sabotage" is what this company calls the stay-away habits of some of its employees. Departmental contests, "scouts" to check on absentees, plenty of publicity, combined to make workers realize importance of being on the job

JAMES MONTAGNES, Canadian Correspondent, *Factory*

When absenteeism through holidays, sickness, and absence without permission reached the figure of one in every eight employees late last summer, the management of John Inglis Co. Ltd., Toronto (Bren guns, Boys anti-tank rifles, Browning aircraft machine guns, marine engines, and boilers) decided to take drastic steps to cut the absenteeism of their 12,000 employees. In a 12-week campaign, from August 30 to November 21, with teamwork and a departmental competitive spirit, absenteeism was cut in half after nine weeks. Lessons were learned that have been applied, and it is expected that the lost-time average throughout the entire plant will not stray far from 7 percent.

The campaign got under way with every employee being given an 8x10 folder in three colors, with illustrations of starving Greeks, on the theme that "Lost Time Is Subtle Sabotage." Included was a pamphlet on how the campaign was to be run, the teams in which the various departments were divided. From each department "scouts" were picked, given badges and a list of names. It was their job to check each day the names on their list, find out who was present, or if absent why, and whether with or without permission. On the return of each absent employee the scout asked him or her to fill out a slip with reasons for the absence. Not everyone filled these slips out, but from those returned with reasons 60 percent signed their name and clock number, although this was not necessary. The reasons given included much humor, satire, and some abuse, but from them it was possible to learn major causes and formulate remedial plans.

Both sides of one of the stuffers put in employees' pay envelopes remind them that absence from the job does nothing toward helping to win the war. Posters in the plant carried the same message



In each department a chart was set up to show progress of the campaign by weeks. Black bars show absences with permission; red bars indicate willful, and probably unnecessary, absenteeism

It was found that the majority of the girls (about half the total employees) were absent because of fatigue (two 10-hour shifts), plus lack of time to do their shopping; to get away from their one-room existence and have some recreation; to go back to the home town for a few days; that men were mainly absent through sickness, shopping with family, or just loafing.

About this time an order to double the production of Bren guns forced the company to change over to three 8-hour shifts. Absenteeism started to drop, although not sharply, as workers had time to shop but did not have as much money to spend. The company also provided the girls with a recreational center under a capable physical education director; pointed out to all employees that the three plant doctors, four hospitals, and 20 trained nurses were on hand to give them aid as soon as they felt a cold coming on, that the plant's dietitian would help in planning healthy meals.

Large departmental charts were set up in each of the 56 departments to show absences of men and girls, with or without leave. At all main exits large charts showed absenteeism records by main plant divisions. After three weeks these charts began to pay dividends, and there was keen rivalry among departments and plant divisions to keep their absence percentages down. Absent employees were reminded with stickers and stuffers in their pay envelopes, and colorful posters throughout the plant bore the slogan "the little gal (or little man) who wasn't there."

In the pamphlet that explained the workings of the campaign, it was stated: "It is neither possible nor proper that there should be any monetary awards offered to the victors in the performance of a simple duty . . . pride of achievement is what must spark us all through this campaign."

Silver flags were presented weekly to the department which showed the lowest absence percentages. These presentations were made in the president's office by high officers of the army, navy, and air force, who told departmental representatives what their work meant to the fighting men. Well-known people presented monthly gold flags, and Wendell Willkie was guest of honor at the presentation of the final winning flags. Internationally known personalities, such as United States Labor Secretary Perkins, Canadian Labor Minister Mitchell, film and radio stars, U. S. Army and Navy officers, and U. S. civilian defense workers in uniform toured the plant, gave the employees a contact with many well-known people. The Canadian Army and Navy were hosts to girls from winning departments, took them on tours of their barracks and ships, showed them where the work they were doing fitted into the fighting picture. The semi-monthly employee paper, *The Shotgun*, kept news of the lost-time campaign up to date with stories and pictures from all departments.

All these factors helped in creating good fellowship among the employees, made them realize what absence from their machines meant to the general war effort and especially to the fighting men. Over 400,000 hours were salvaged during the drive.

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MANAGEMENT SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary management accomplishments. Accepted articles will be paid for

Scheduling a Sixty-Hour Week

EUGENE A. CONKLIN, Watertown, N. Y.

Workers at the Watertown Air Brake have been putting in a 48-hour week. The necessity arises for more work-hours. But many workers dislike to lose their week ends with the family.

The following scheme seems to meet both the above conditions: Working ten hours daily, from 10 p.m. to 8 a.m. and from 12 noon to 10 p.m., two shifts daily. The worker on the night shift works from Sunday through Friday night. He has from 8 a.m. Saturday until 10 p.m. Sunday night, or practically all the week end to himself. Workers on the day shift have Saturday night, Sunday morning and night for their leisure time activities. This means that fathers and sons can take a hike or see a football game for a change, that the "missus" will not be the forgotten woman.

Air Brake officials find that the additional two hours in the stretch does not overtax the worker with a consequent let-down on the final two hours of the shift. By the second day workers find themselves accustomed to standing the augmented hours, and feel little fatigue.

•

New Design Permits Quick Assembly

In an effort to get more done in less time, the Vega Aircraft Corporation, Burbank, Calif., found a way to use the wiring board for assembling of electrical wiring more efficiently.

A wiring board generally comprises a wooden table on which the path of the wires which make up the wire circuits is traced. Posts are located alongside the trace to keep the wire in place as it is laid on the board. The wires are laid one at a time and are then laced together. The complete assembly forms a harness which is ready for installation in the airplane.

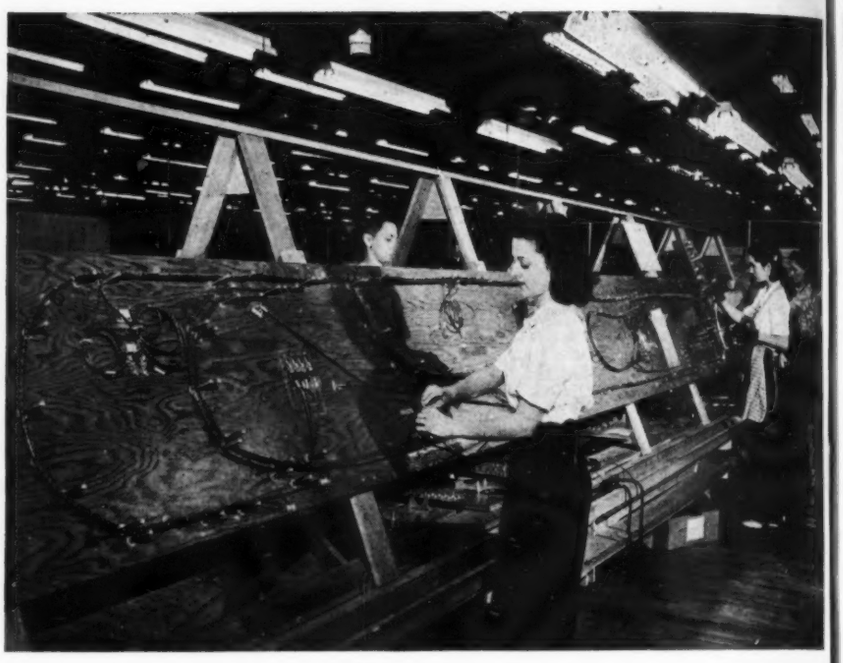
The boards at Vega have been designed to permit the simultaneous assembly of several harnesses. This permits a better labor load distribution and a maximum utilization of the assembly board.

Some of the boards are used not only for assembling but also as test boards for checking the continuity and resistance of the circuit for wiring errors.

The wires used on the Vega boards are continuously coded by means of a printing roller (devised by Vega employees) through which the electric wire is run prior to assembly.

The use of wiring boards and harnesses in place of conventional conduits, either fixed or flexible, presents a number of advantages. It not only saves aluminum tubing, but also its procurement, storing, handling, cutting, and bending.

Furthermore, conduit must be installed in the airplane, and the wires pulled through it, in the crowded space of the fuselage. This constitutes long and expensive operation. By the use of open wiring the weight of the conduit is eliminated and the time necessary for the wiring of the airplane is cut down considerably. In case of direct hit by shrapnel or a bullet, the open wire circuits are easier to repair than the conduit-type circuit.



Setting wiring board almost vertical saves floor space and adds convenience in wiring. Women operators learn this job quickly and easily

War-Winning Ideas

Selected suggestions from war workers. Each of the following has been awarded a WPB Certificate of Individual Production Merit or has received honorable mention from the War Production Board:

Suggestion No. 1

New method of applying stencils saves lumber and man-hours.

Made by Martin L. Pearson, Yellow Truck & Coach Manufacturing Company, General Motors Corporation, Pontiac, Michigan.

For a long time the standard method of marking the weight, carrying capacity, destination, etc., of a truck was by stenciling this necessary information on a wooden board and wiring the board to the underside of the truck body. By stenciling this information directly upon the body of the truck, thus doing away with the use of boards and the need of wiring them on, a saving has been brought about of 36,000 square feet of lumber and 484 work-hours in a 60-day period.

Suggestion No. 2

Perforated false bottom in dump trucks drains oil from chips.

Made by Edgar Gaston, Cadillac Motor Car Division, General Motors Corporation, Detroit.

(Continued on page 224)

MAINTENANCE SERVICES

The well-maintained plant is the high-production plant

SELECTION • INSTALLATION • INSPECTION • UPKEEP • ORGANIZATION

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MAINTENANCE as the Editors See It

Warn Your Men About the New Incendiary Bombs

INCENDIARY BOMBS now being dropped by the Germans are much more dangerous and difficult to handle than the types in use until a few months ago. That is the warning recently issued by the U. S. Office of Civilian Defense.

Until recently the fire bomb most commonly dropped was a magnesium incendiary weighing 2.2 pounds. A certain proportion of these bombs contained an explosive charge. Incendiaries of the new type carry heavier, delayed-action explosive charges. For example, the 5-pound incendiary contains a heavy charge of explosive, which may go off at any interval up to 7 minutes after the bomb strikes. A larger bomb weighing 110 pounds contains 66 separate incendiary units and a 12-pound explosive charge, which goes off in a few moments.

This matter is of more than academic interest to plant executives because thus far plant protective forces have been trained to fight incendiary bombs at close range with water jets or sprays, and sand. Fighting these new bombs presents new problems.

According to OCD Publication 5209 the equivalent of 4½ inches of brickwork or concrete block is required to give protection against the explosive charge of a small magnesium bomb.

Incendiary bombs and the fires they start must be attacked vigorously, of course, but it is obvious that plant protection personnel must be taught how to fight dangers that formerly were slight.

Maintenance Should Share in Post-War Planning

IT IS FITTING that maintenance engineers should do more than a little post-war planning. Men at the head of other departments of the plant are doing so. The chief designer is already planning to use new and better, and in most cases less costly, materials. The production head is contemplating better and faster methods. The product and market research people are trying to see the way ahead.

All of them have their minds on two things—making products that will sell, and making jobs for people. They don't want millions of returned soldiers to be without jobs, and they don't want WPA's and NYA's. They know they are going to face not only the old-time home competition but a desperate competition on the part of other nations trying either to rehabilitate themselves or to get on an industrial footing for the first time.

It is not going to be a walkover, this post-war competition. Service equipment that will not serve both promptly and adequately is going to be a liability. Production equipment that breaks down or turns out substandard products will be a detriment. Buildings that do not properly protect product, equipment, and workers obstruct production.

In the day-to-day necessity to keep things going on a 24-hour basis, many things of a permanent nature have to be left undone by maintenance; the demand for immediate operation is controlling. However, there is serious danger that emergency work will become the rule instead of the exception. It's habit-forming.

Some plants are finding it feasible, even in these difficult times, to give equipment—unit by unit—complete overhaul. They are not going to be caught with a lot of worn out machinery when they have to reconvert to peacetime products.

Constant reconditioning should be an objective. The very least a good maintenance engineer should allow himself to do about the future, if he now has to rely upon emergency upkeep, is to have all his post-war maintenance work planned. And he should have his plans on paper; unless he can write them out, they probably aren't so good.

One way or another, the people responsible for maintenance of plant and equipment have got to find time to look ahead.

Could a Fire Damage Your Main Cables?

THE IMPORTANCE of protecting power cables against damage by fire was forcibly demonstrated recently to the executives of a midwestern plant. When insulation on control wires became ignited through arcing at a starter, the fire made its way along the wires into a junction box containing the main power cables. These cables were protected to some extent by a fire-retardant covering over the insulation, but this covering was not sufficient to withstand the merry blaze fed by the control wire insulation. Results were considerable damage to the power cables and a week's shutdown.

With new installations it is comparatively easy to guard against fire damage to main cables.

Existing installations offer less freedom of choice in the application of protective measures. It is frequently possible, however, to wrap important cables having combustible insulation with a couple of layers of asbestos tape coated with sodium silicate. Such covering will give enough protection to make its use decidedly worth while. Almost anything that can be done to make power cables less vulnerable is worth considering.

Reduces Machine Downtime by Welded Repairs

G. J. LOUGHERY, Master Mechanic, Edgewater, N. J., Works, Aluminum Company of America

NEW AND IMPROVED METHODS of accomplishing a task often result from emergencies. Maintenance and repair workers are daily discovering or formulating timesaving schemes to repair damage more quickly and with no loss in the quality of the work.

A good example of such timesaving effort by industry is to be found in our plant, where engineers have recognized the advantages of electric arc welding as a quick, efficient method of repairing damaged equipment. Continued and extensive use of arc welding for repair at the plant has enabled the number of man-hours lost to be cut to a minimum, as well as improving the quality of the work and eliminating the purchase of a great deal of costly machinery and equipment.

What Welders Do

Included in the maintenance and repair division of the plant at Edgewater are nine electric welders whose work has made possible the production miracles of "the men behind the men behind the guns." These welders are responsible for repairing all the damaged or broken machine parts that can be fixed by arc welding. The men are stationed in the machine shop where, in addition to repair work, a large amount of equipment construction and fabricating is done. They are part of the plant's mechanical department, which includes machinists, ironworkers, millwrights, and blacksmiths.

If a small casting breaks down—one weighing up to approximately 10 pounds—it is removed, if possible, from the machine of which it is a part and taken to the machine shop to be welded. When the damaged part cannot be removed, or is too large to be taken to the machine shop, the repair work takes place out in the plant, wherever the breakdown may have occurred.

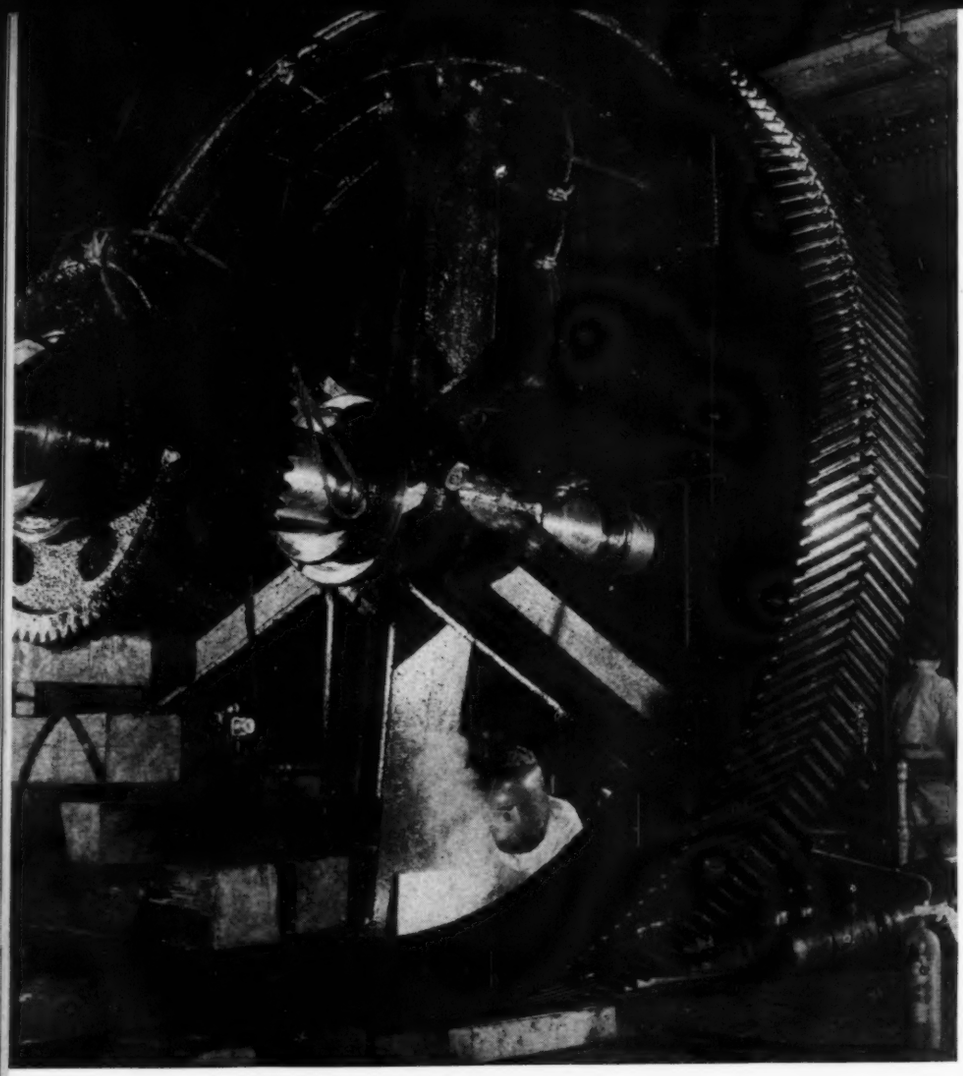
Each of the nine repair welders is equipped with a mobile electric welding unit that can be transported to any part of the plant. There the larger casting can be worked on in its normal position or can be removed a short distance by crane to facilitate the repair work.

A crack that has developed in an aluminum coil upender is repaired in short order by an arc welder with his portable equipment

It is evident that the chief value of such repair work lies in the speed with which broken parts can be put back into operation. A typical example serves to illustrate this point.

A yoke on one of the plant's large presses cracked, and required repair as quickly as possible in order not to slow down the production of vital war materials. Under the plant's system of making repairs, the yoke was removed, the crack repaired by one of the mobile arc welding units, and the press put back in full-time operation within 10 days.

Contrast this with the procedure that would be required if such a set-up did not exist. The machine would have to be dismantled. An order for either a new casting or an entire new press would be placed with a concern handling such material. In all probability this concern would be several hundred miles from Edgewater. It would have to make a mold, cast the part, and ship it to our plant. By



repaired parts stand up as long or longer under heavy wear as new parts. A casting will break at its weakest point regardless of its age. Repairing a break or crack by welding tends to make the defective point stronger than it was before.

We have many other instances of broken machinery, as is natural at an industrial plant of this size. Broken gear teeth are common casualties in an aluminum plant, and in every possible case the repair is made by arc welding.

Connecting rods and crankshafts for forging presses are other rather common subjects for arc welding repair work. End plates for guillotine shears can be also classified in this group.

The mechanical department, made up of Edgewater's maintenance and repair men, is under the mechanical engineering division. The importance of the repair welders is shown by the fact that they are working in shifts which total 24 hours every day of the week. Their busiest periods are often at night and on Sunday, at which times rush repair work is done to minimize interruptions to production activity. Much time is saved this way, and the results of the plant's production efforts reflect the benefits derived from the successful operation of a workable equipment repair system.

Arc welding to the rescue. Above, a crack in one of the spokes of a mill drive gear needs attention. Right, the welder is shown repairing a wabbler on a roll

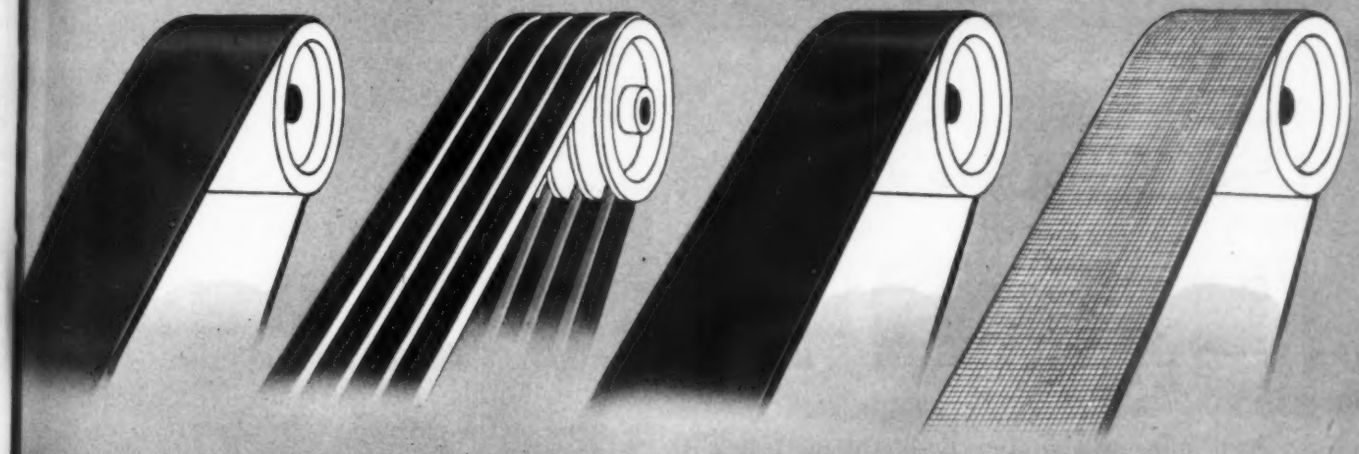
the time the press was placed in operation again, judging from past experience, from 8 to 10 weeks might have elapsed. This period of time is the shortest that could be expected in such a case. Transportation obstacles, difficulties in obtaining materials, and delays in having the order filled promptly because of the large volume of machine-making business existing at the present time, all might well tie up the operation far beyond the minimum period of from two to three months.

In addition to the timesaving element, Edgewater maintenance officials also approve of the quality of work done by arc welding. They find that

★ The well-maintained plant is the high-production plant

How to Get the Most Out of

BELTS



LEATHER

FABRIC

V-BELTS

CONSERVE EQUIPMENT TO HELP WIN THE WAR

RUBBER

WHAT TO DO · WHAT TO AVOID

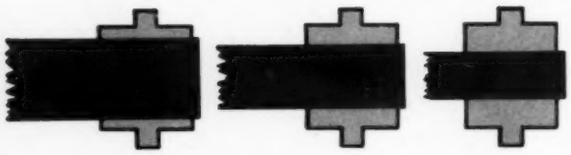
In Installation · Inspection · Upkeep

An Eight-Page Editorial Feature

HOW TO INSTALL AND CARE FOR BELTS

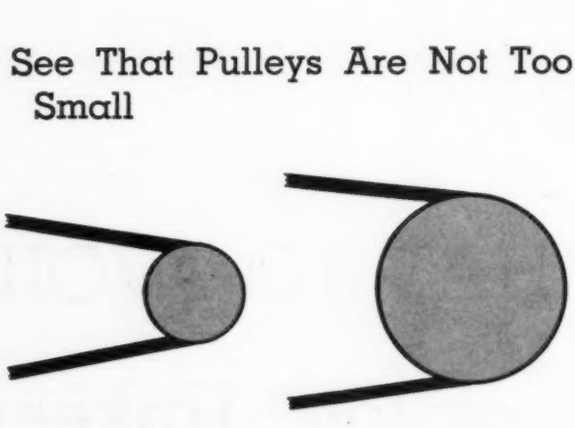
Correct application is 90 percent of the job in getting the most out of belts. Follow up with regular servicing and belts will give a minimum of trouble

1 Select Liberal Sizes of Belts



Overloading will shorten the life of any belt and is likely to cause unnecessary trouble so long as the belt operates. Belt rating tables are available from manufacturers. Follow the recommendations of these tables. Make a liberal allowance for overloads.

2 See That Pulleys Are Not Too Small

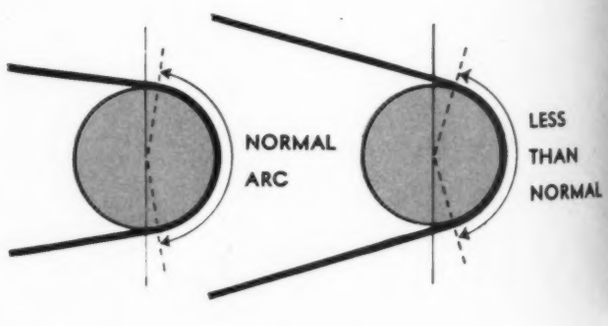


When any belts run over a pulley that is of less than the recommended diameter they are subjected to unnecessarily severe bending and stresses that shorten their life and decrease pulling capacity. Always consult manufacturers' tables of recommended pulley diameters before installing.

3 Condition Belts Before Putting Them on the Pulleys

Whenever possible, keep belts for at least two days—a week is better—in the room or under the same conditions in which they will operate, in order to avoid shrinkage or elongation after the belts have been put on the pulleys.

4 Make Necessary Allowance for the Arc of Contact



The greater the wrap or contact of a belt on the driving pulley, the greater the pulling power. This means that with a large arc of contact on the driving pulley a belt will transmit the same amount of power under lower tension than would be needed with a small arc. When the arc of contact of any belt is less or greater than the value used in rating the belt, apply the correction factor to be found in belting tables.

DON'T...

DON'T FORCE TIGHT BELTS OVER PULLEYS OR SHEAVES

There's danger of stretching one side of a flat belt more than the other, causing it to run crooked, or rupturing a V-belt

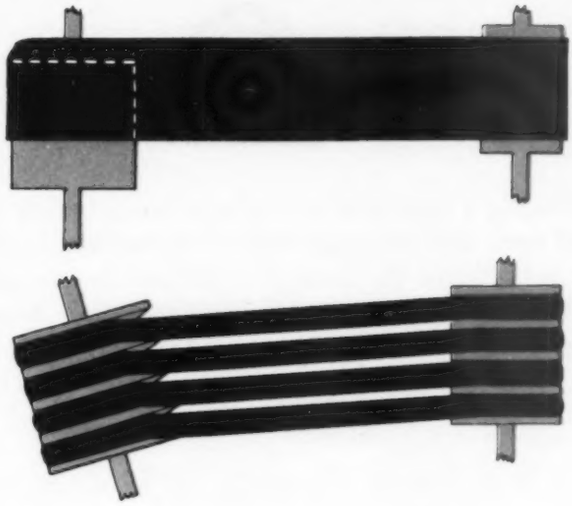
DON'T LET BELTS RUB AGAINST ANYTHING

It's one of the most effective ways to fray the edges and grind off material that ought to be transmitting power, instead of floating around in the air

5 Make Belts Endless When Possible

Belts that have been properly made endless by cementing or vulcanizing offer worth-while advantages when conditions permit their use. Whenever it can be done, it is usually better to have belts made endless on the job.

6 See That Pulleys and Shafting Are in Alignment

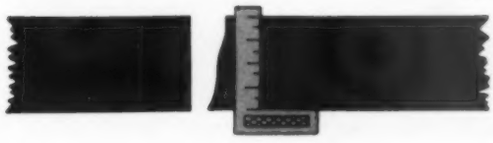


Flat belts operating over misaligned pulleys tend to run off or will rub against or climb up on flanged or step-cone pulleys. Life and quality of service are reduced. When V-belt sheaves are not in proper alignment the belts are subjected to excessive side wear that will eventually cause premature breakdown.

7 Select Proper Types and Sizes of Fasteners

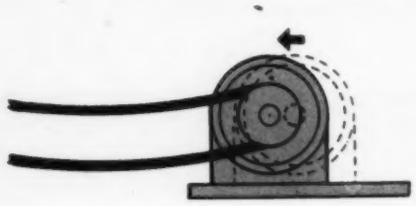
There are a number of good fasteners available, but careless application or use of the wrong size is likely to lead to trouble. When metal fasteners are used it is important to see that prongs or other parts are embedded in the belt, to prevent damage to paper or wood pulleys. Leather lacing is recommended, for safety, on belts that must be shifted by hand.

8 Cut End of Belts Square When Joining



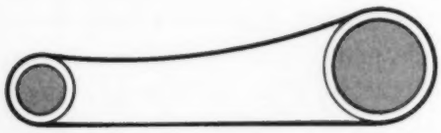
If the ends of a belt are not cut exactly at a right angle to the sides it will tend to run crooked and leave the pulleys.

9 Slack Off When Installing



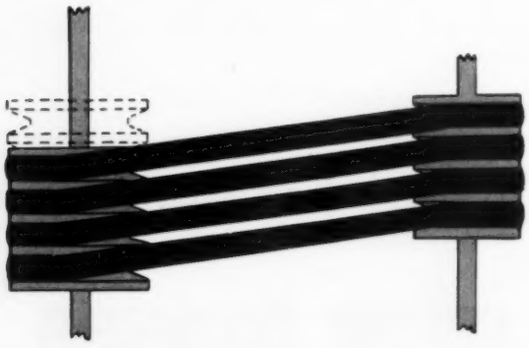
Forcing a tight belt of any type over a pulley is hard work and dangerous both to the mechanic and the belt. When the fibers of a belt are torn or distorted some of its strength and life have been reduced.

10 Put Slack Strands of Flat Belts on Top



Installing a belt on a horizontal drive with the slack strand on top will tend to increase the arc of contact on the pulleys and therefore increase pulling power and decrease any tendency to slip.

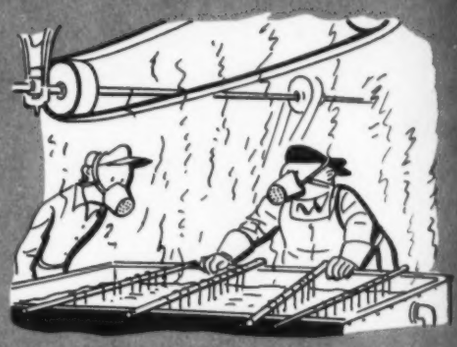
11 See That Pulleys and Sheaves Are Tight



If pulleys or sheaves are permitted to slide along the shaft, trouble may be expected. Flat belts will tend to ride off the pulleys. V-belts will be subjected to side wear that will soon cause serious damage.

DON'T...

DON'T EXPOSE TO CORROSIVE FUMES

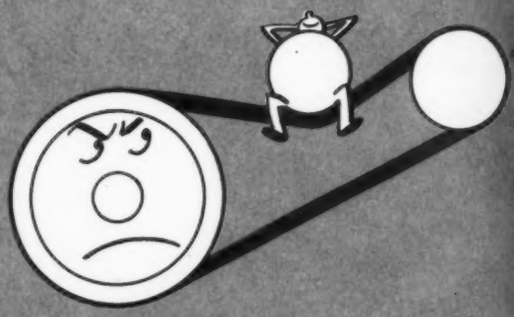


Acids and alkalis—or almost any material that will burn your hands—will eventually burn the life out of a belt

DON'T LET DIRT ACCUMULATE ON BELTS

Dirt tends to increase wear and slippage, may form lumps that bruise and injure the belt

DON'T USE IDLER ON V-BELTS



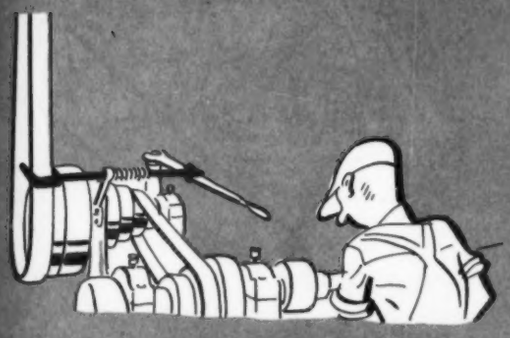
There are other and better ways of putting tension on V-belts, that will not increase the wear and tear on them

DON'T FAIL TO CEMENT LAPS THAT OPEN UP

In flat belts, laps that are beginning to fail are weak spots that will rapidly get weaker until failure occurs

DON'T...

DON'T LET SHIFTER LEAVE BELT PARTLY ON OR OFF LOOSE PULLEY

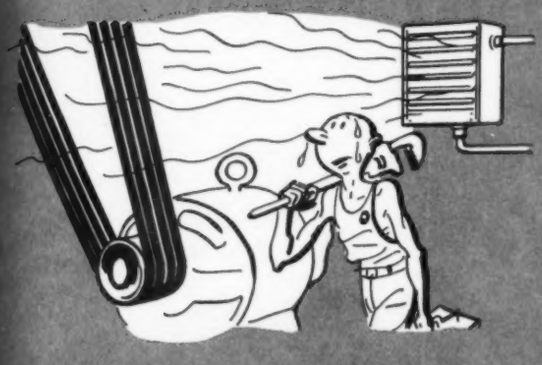


A belt that is neither on nor off a loose pulley is neither working nor idling; it's just wearing itself out

DON'T LET BELTS SLIP

That is about the same as asking them to act as brake bands—a service for which they are not designed

DON'T EXPOSE BELTS TO EXCESSIVE HEAT



Some belts stand a high temperature better than others, but heat tends to hasten deterioration, is something to be avoided

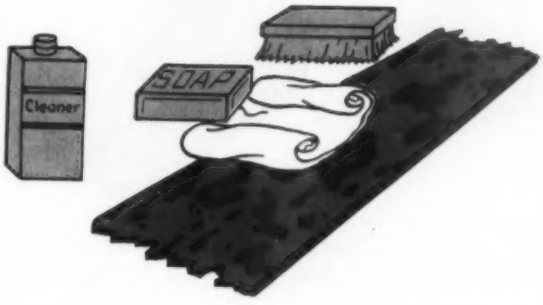
DON'T USE IMPROPER BELT DRESSING

Belt dressings are like medicines; they are not to be used indiscriminately. Some belts do not require dressing. Improper or inferior materials may do more harm than good to belts that do need it

12 Maintain Proper Belt Tension

Any belt will give best service and life when it is operated under tension great enough to prevent slipping. Excessive tension places unnecessary stresses on the belt and increases bearing pressures beyond normal value. On the other hand, too little tension will permit a belt to slip, resulting in burning and glazing of the surface.

13 Keep Belts Clean



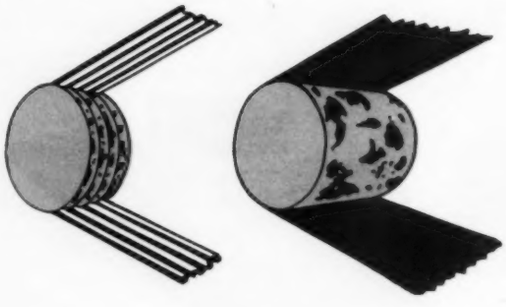
Oil and grease may be removed from canvas, rubber, or V-belts with soap and water, or a mixture of 60 percent carbon tetrachloride and 40 percent high-test gasoline containing no tetra-ethyl lead. Leather belts may be scrubbed with a stiff brush dipped in this mixture, or they may be soaked in it for a few hours. Dress leather belts after they have been cleaned in this manner.

14 Protect From Drip

Liquids of any kind falling on belts produce at best highly undesirable conditions. Most liquids to which belts may be exposed are distinctly harmful to them. For example, oil causes ordinary types of rubber belts to swell, soften, and disintegrate. On

leather belts oil causes loss of pulling power and reduces the life. Acids and alkalis cause rapid deterioration. If contact with liquids cannot be entirely avoided, use types of belts designed for the conditions.

15 Keep Sheaves and Pulleys Clean



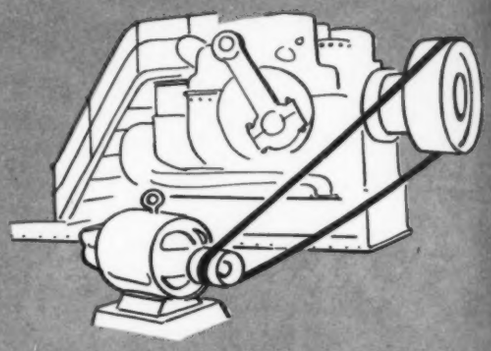
Accumulations of dirt or rust in V-belt sheaves tend to cause rapid wear, with consequent shortening of the life. The hard lumps that tend to form on flat belt pulleys are likewise objectionable. Remove them at frequent intervals, since they may cause blisters and separation of plies.

16 Inspect Belts Frequently

Prompt detection and repair of all defects before they become serious are important factors in obtaining maximum service and life from belts. Small defects can usually be detected only by a careful inspection made at intervals whose frequency will depend on such factors as the age of the belt, service conditions, number of hours of operation a day.

DON'T...

DON'T OVERLOAD ANY BELT

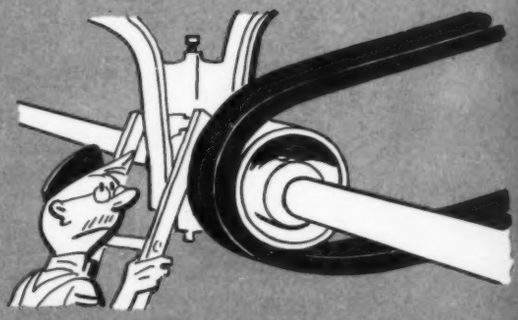


Any saving or advantage secured by serious overloading is temporary and costly, because it is paid for in shorter belt life

DON'T RUN ABOVE RECOMMENDED SPEED

At extreme speeds centrifugal force tends to lift a belt from the pulleys, causing slippage and reducing pulling power

DON'T USE BELT TOO THICK FOR PULLEY DIAMETER



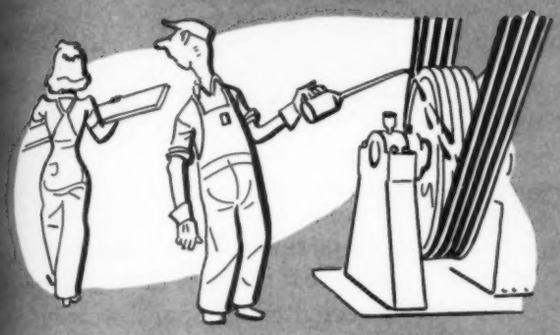
Thick belts, like big trucks, must have plenty of room to turn around in, or they will wear themselves out trying

DON'T RUN BELTS OVER MISALIGNED PULLEYS

Snakes can easily follow a crooked path, but belts can't; forcing them to do so causes wear and deterioration

DON'T...

DON'T LET OIL GET ON BELTS

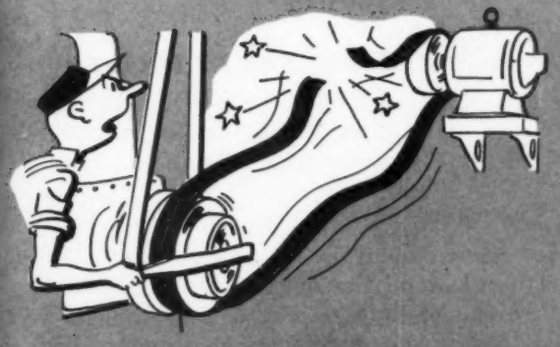


Oil is a lifesaver for bearings, but it's poison to some belts and is a hindrance, rather than a help, to any belt

DON'T EXPOSE RUBBER BELTS IN STORAGE TO SUNLIGHT OR HEAT

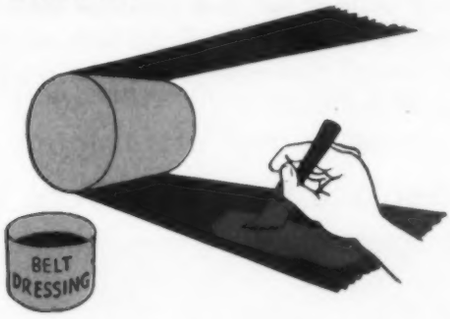
These conditions are unhealthy for rubber, cause it to dry out and deteriorate

DON'T PUT A BELT ON A FAST-RUNNING PULLEY



The sudden shock produced when the belt takes hold and tries to start the load will strain the belt severely, may break it

17 Apply Dressing to Belts That Need It



Under normal operating conditions leather belts require application of a good dressing every three to six months. Warm the dressing and apply only a small quantity at a time. Avoid the use of dressing on rubber belts. On canvas belts, use only materials recommended by the manufacturer.

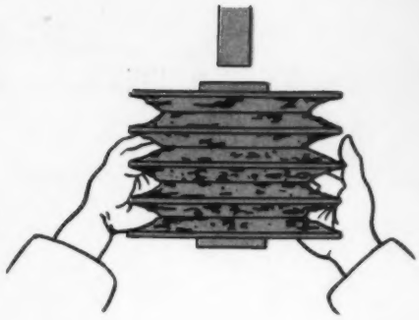
18 Replace All V-Belts on a Drive at the Same Time

V-belts that have been in service have stretched somewhat, dried out to some extent, and undergone other changes that give them different characteristics from those possessed by new belts. When new and old belts are mixed on a drive the new belts will carry more than their share of the load and therefore wear out prematurely.

19 Use Matched Sets of V-Belts

When belts that differ slightly in length are used on the same drive the short belts will carry more than their share of the load and thus tend to wear out faster. In matched sets all the belts are so nearly the same length that each will carry its proportionate share of the load.

20 Replace Rough or Worn V-Belt Sheaves



In time the grooves of V-belt sheaves may become rough, pitted by rust or corrosion, or worn. Rough or pitted grooves will grind off the protective covering on the side of the belts and greatly reduce their life. Belts do not seat properly in worn grooves; hence they are subjected to unusual distortion and wear which use up part of their normal life.

WHAT TO LOOK FOR IN BELT INSPECTION

1. LOOSENING OF LAPS OR PLIES

Whatever the cause of these defects, they are weak spots. Repair as soon as possible. With leather belts make sure that the outside feather edge of the lap points away from the direction of travel.

2. DRY CONDITION

Leather belts tend to dry out due to loss of fiber lubricant added during manufacture. Replace by dressing frequently enough to keep belts soft and pliable. Some fabric belts also require dressing at intervals.

3. LACES TEARING LOOSE

Check rawhide or wire laces for wear or broken strands. Also see whether there are tears around the holes in the ends of the belt.

4. OIL-SOAKED CONDITION

Rubber belts exposed to oil become soft and swollen. Excessive lubricating oil in leather belts makes them limp and lifeless.

5. MISALIGNMENT OF PULLEYS AND SHAFTING

Usual sign is when a flat belt runs off a pulley or climbs on flange or step-cone pulleys. Check alignment of pulleys and sheaves with a taut string. Shaft alignment can be tested with a level, large square, and taut string.

6. CRACKS AND TEARS

May indicate excessive tension, use of too small pulley, overloading, dry condition, slippage.

7. IMPROPER TENSION

Excessive tension may be indicated by heating or rapid wear of bearings, or tearing of belt. Slippage usually shows too little tension.

8. EXCESSIVE OR WORN CROWN ON PULLEYS

Too-high crowns will throw a belt off the pulleys as quickly as no crown. Consult manufacturers' tables for recommended height of crown.

9. WEAVING OF BELT

Sidewise belt movement usually is caused by wobbling of the pulleys or a high spot on one pulley.

10. ACCUMULATIONS OF DIRT

A coating of dirt will impair the pulley-gripping qualities of a belt, causing slippage.

11. WHIPPING OR SLAPPING

May be caused by a pulsating load or power source, a lopsided pulley, bent shaft, uneven belt, overload, or too light load.

13. RUNNING TO ONE SIDE OF PULLEY

Usually due to a crooked belt, or misalignment of pulleys or shafting. It may also be caused by too much slack or an increase in load.

12. SLIPPAGE

May be indicated by squealing. A glazed or burned surface on the pulley side of the belt is another sign of slippage. Use of a tachometer on driving and driven shafts gives an accurate check.

Quick-Dried by Infra-Red

In baking and drying—as in most other operations today—time comes first. So infra-red lamps. They work fast, waste almost no heat, are easy to install

REGARDLESS OF HOW GENERATED, heat increases the temperature of the work being processed—whether that work is to be heated, cured, dried, or expanded. There are many ways in which heat can be generated, but only three ways by which it can be transmitted from its source to the object or surface to be heated—conduction, convection, or radiation.

Holding the end of an iron bar in a fire heats the whole length of the bar; that is conduction. Heat by convection requires a liquid, air, or some other medium for transmission.

Radiant heat requires no solids, liquids, or gases for its transmission. As the energy of the sun is radiated through the millions of miles of void, so radiant heat for industrial purposes is transmitted from its source direct to the surface on which it falls, with no wasteful heating of the surrounding atmosphere.

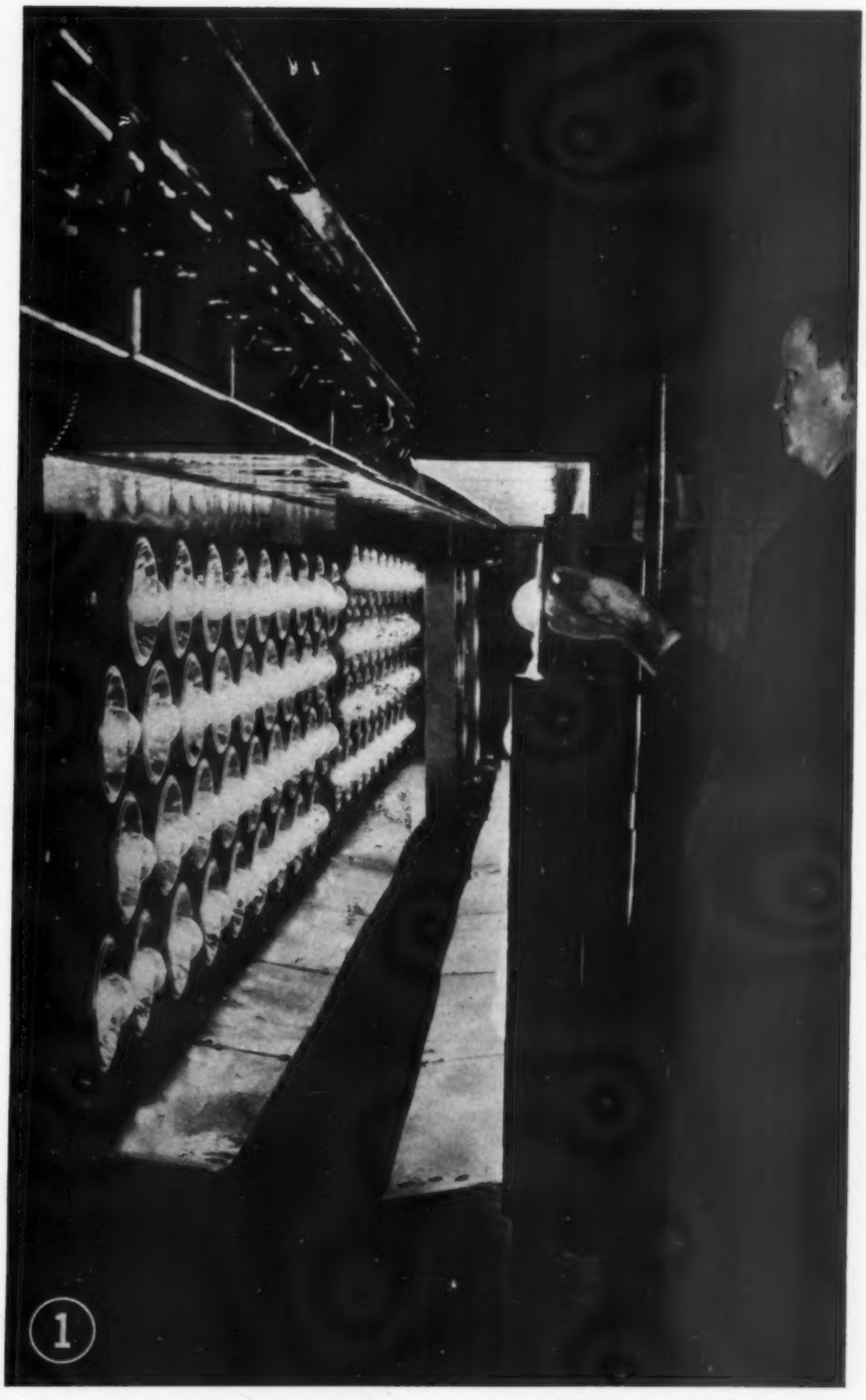
Energy Into Heat

The incandescent filament lamp used for commercial heating and drying processes converts aproximately 90 percent of the energy consumed into heat, most of which is in the infra-red portion of the spectrum. It is, therefore, an efficient form of infra-red or radiant heat generator.

Generally, for most uniform application of heat, materials should be moving—as on a conveyor. The lamps may be operated in any position, thus making it possible to apply heat to one side, both sides, top, or bottom of the object. Infra-red rays cast a "shadow," which, although it is invisible to the eye, coincides with the visible shadow cast by the light from the radiant heat lamp. Hence lamps should be arranged to cast as little shadow as possible.

Two broad general types of drying lamps are available. One has a built-in reflector and the other requires a reflector of gold-plated material.

Most of the industrial processes that require heat offer possibilities for the use of infra-red units. On this and the following pages are shown a few of the many possible applications.



1 Enamel finishes on interiors of steel storage files are baked in five minutes compared with the former baking time of five hours, at Steel Storage Company, Cleveland. When trial installations were made, about 500 tests were run. After the first 100, an experimental conveyor was laid out, equipped with infra-red lamps in gold-plated reflectors. This

installation was so satisfactory that the radiant heat tunnel illustrated here was designed and constructed.

2 As much as four hours' time on a single operation was saved on single assemblies by using infra-red on glued joints—where pressure cannot be taken off until the glue is set. The time of curing varies from six or seven hours at low temperatures to a few minutes at high. A word of caution is necessary when infra-red heat is used on wood. The lamps must not be placed too close to the work or scorching may result. Single units, such as shown here, can be used for repair work, small parts, and doublers.

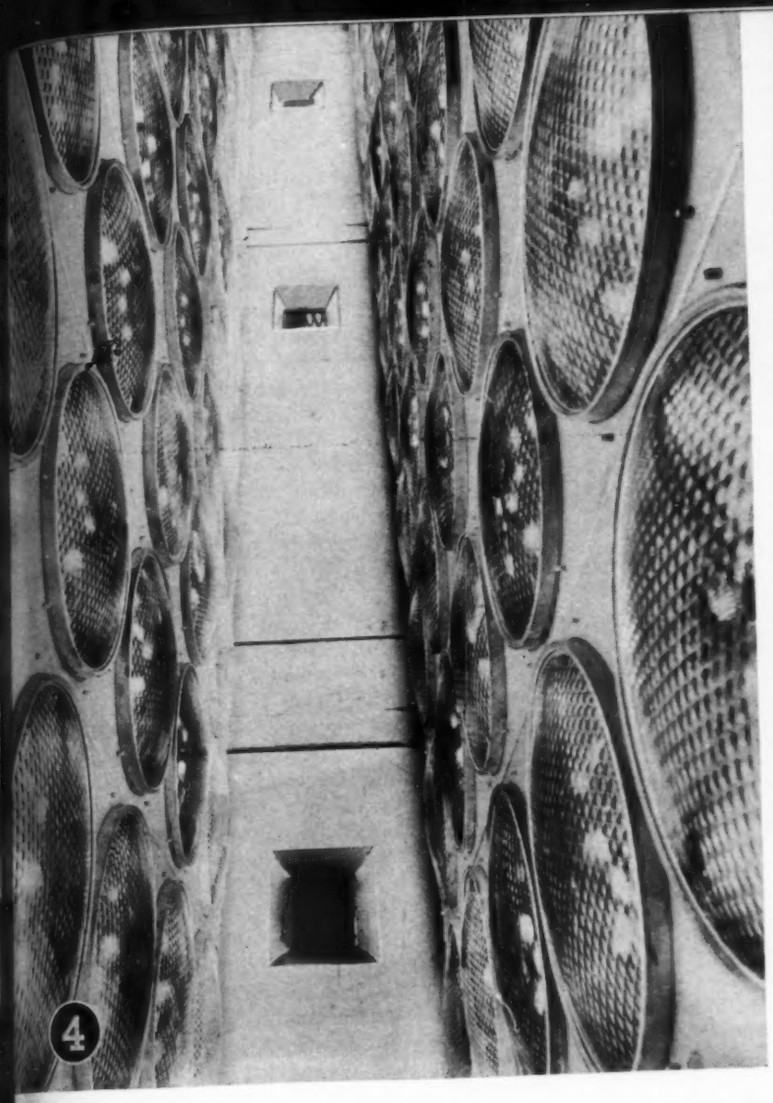
3 Doubled production is the result of using infra-red to dry sand casting molds. At Pittsburgh Cast Products Company, Swissvale, Pa., banks of six infra-red lamps with built-in reflectors cut drying time to one-third, and rejects were reduced 15 percent.

4 Tower-type dryer, three stories high, is used for processing rubber, paper, textiles, and other materials in continuous sheet form. Because of its vertical construction, it conserves floor space. Operating speed is 16 yards per minute. Sheet tension roll is at oven top.

5 Oven for continuous baking of two-coat finishes on massive steel products. Loop conveyor avoids rehandling of work, with the first and second coats of paint applied at opposite ends of the oven. Air is kept under pressure with a recirculating system from which the bleeding-off of the exhaust gases is provided. Conveyor speed is 2 feet per minute; average baking time, 12 minutes.

6 A New England woolen mill has installed an infra-red carbonizer to remove shives, burrs, and other vegetable matter from material. Cloth is saturated with a weak solution of acid, dried at low temperatures, baked at 260 to 265 degrees Fahrenheit. In the final baking the acid reacts with the vegetable matter, reducing it to carbon which is later "powdered" out of the cloth. Final baking is accomplished in radiant heat equipment illustrated. Cabinet is 7 feet high by 7 feet wide, open at top and bottom to allow volatiles to pass out of the top by chimney action.

Photographs: 1 and 2, General Electric; 3 and 6, Westinghouse; 4 and 5, C. M. Hall Lamp Company.



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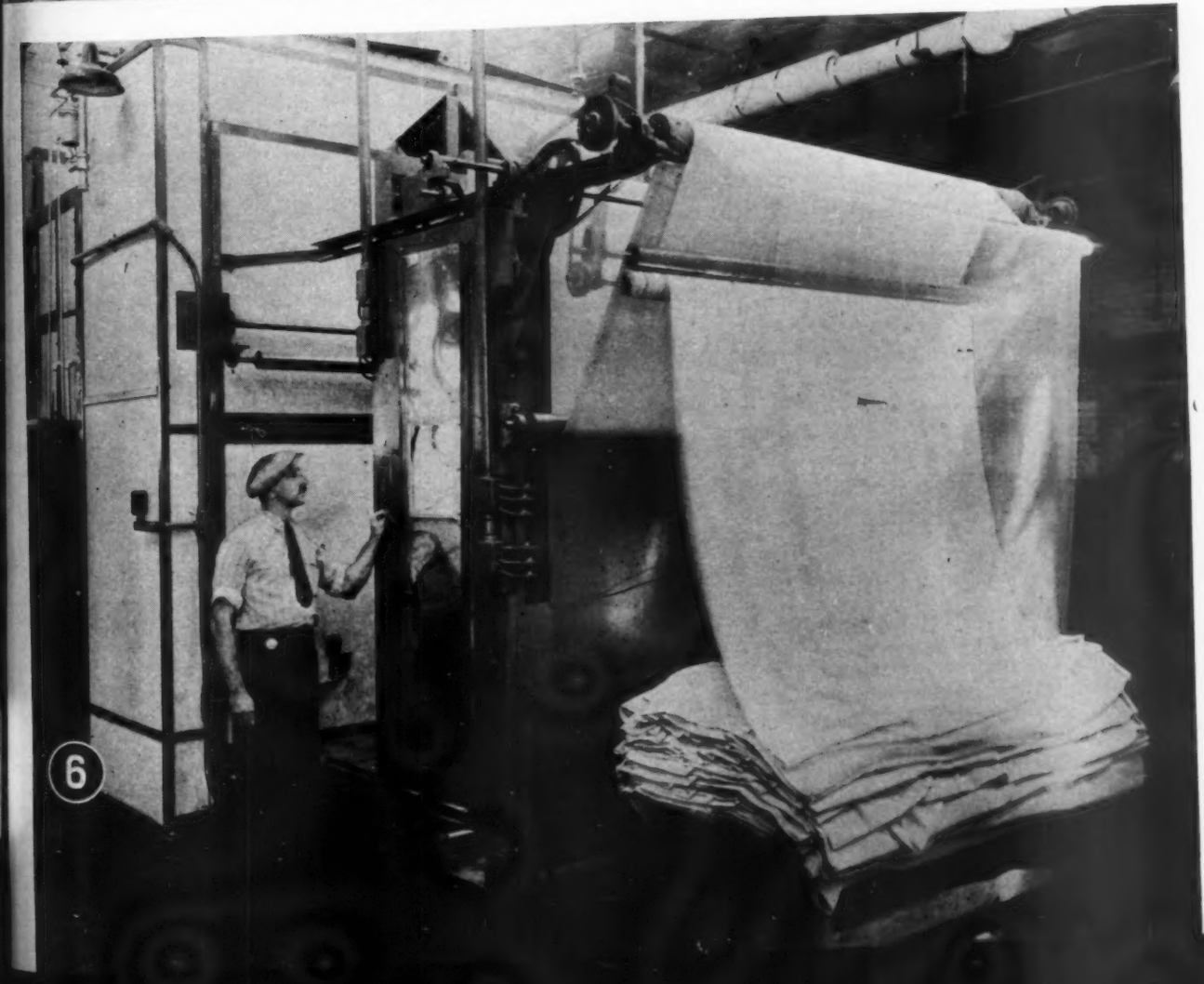
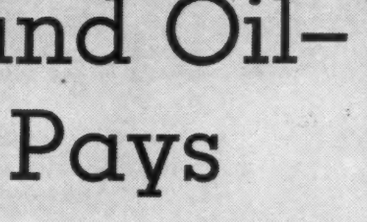


6

How to Salvage Chips and Oil—Why It Pays

WILLIAM HEYMANN
Turbine Equipment Co., New York



COMPLETELY INTEGRATED chip salvage and cutting-oil reclamation systems can be designed for small as well as large plants—and operated with savings not only in metal and oil but also in man-hours, factory space, and tool life. An important phase of plant operation has, in these days of scarcity, become a vital one.

Every plant presents its own problems. How expertly they are solved depends upon the ingenuity and the experience of the designer. Considerable thought and attention must be given to the planning, but it will certainly be time and energy well spent and well rewarded in terms of final economy.

Estimated savings may be based on the following six broad headings:

1. Reduction in the space required to store crushed turnings. Crushed turnings can be stored in one-fourth the space that long, curly turnings occupy.

2. Reduction in the amount of new cutting oil that must be bought. An average system can reclaim from 30 to 50 gallons of oil from each ton of processed steel turnings.

3. Increase in the price per ton obtainable from the scrap dealer for dry, crushed turnings in carload or truckload lots.

4. Prolonged cutting tool life. Reclamation of cutting oil makes it economical to change the oil oftener. This eliminates to a great extent the suspended carbon particles that burn and dull the tool's cutting edge. Thus there is considerable reduction in the number of hours that a machine has to stand idle while it is being retooled.

5. Reduction in lost man-hours. The system can be designed to be operated by a small number of men. Two or three men can run a 20-ton per shift system. Wheelbarrow men, rakers, and shovelers can be put to more productive labor.

6. Reduction in absences due to dermatitis. In systems where the cutting oil is sterilized a definite reduction in hand infections has been noted.

The savings are there. A conference with the production manager, the personnel manager, and the scrap dealer will transmute these abstracts into material dollars and cents.

The average turnings salvage and cutting-oil reclamation system functions as follows:

At certain set intervals the machine sumps are cleared of metal turnings, sludge, and cutting oil. Shop boxes or tote carts of either standard or special design may be used as receptacles.

Use Color Code

Because the segregation of metals is of great importance, it is wise to paint the receptacles in a color code. For instance, blue may be used for steel turnings, brown for copper, yellow for brass, and so forth. Strict attention must be given to keeping the metals separated, since WPB regulations call for complete segregation. It will also be found that the scrap dealer will pay more for a ton of graded chips than he will for a ton of mixed chips.

Receptacles are brought to the reclamation room, which should be conveniently and centrally located. There their contents are raised to the crusher platform, if the crusher is located above the floor, and automatically dumped. Turnings are then fed manually into the top of the crusher, broken into "shovelings." These crushed turnings or chips are then fed by gravity into one or a battery of centrifugal chip extractors.

At Floor Level

Where sufficient headroom is not available, the turnings loading platform may be located at floor level, which would also be the level of the crusher month. The oily turnings are then dumped on the platform, which has drainage facilities, and are manually raked into the crusher. A bucket elevator then catches the crushed turnings at the bottom of the crusher and elevates them to a point where they can be fed to the chip extractor by gravity.

This method may require considerable excavation, because 8 or 9 feet are needed below the crusher mouth for setting the machinery. However, in plants with a basement or in localities where excavation presents no problem this scheme may prove to be preferable.

In either case, the turnings loading platform should be made as long as possible, never shorter than 5 feet. This affords some storage space in case the delivery of the chips gets ahead of the crushing. Also it gives the crusher operator an opportunity to remove bar ends, waste rags, bottles, and other extraneous matter from the work. This is important, especially when a blower system is used to convey the whirled chips to a chip storage bin. It is wise also to arrange for a bundle breaker on the raking platform. Two 1-in. rods fastened upright on 12-in. centers will do the job nicely.

After the chips have been whirled dry in the extractor, they are lifted out of the machine and conveyed to a chip storage bin for periodic removal. The bin should be conveniently located at a railroad siding or a truck-loading platform.

Chips can be conveyed to the chip storage bin by a bucket elevator or a blower system. The former will be found more economical if one type of chip is to be handled for a short distance. However, where several types of chips are to be handled and

segregated and the runs are long, the blower system is the most efficient and the least expensive.

Whether or not a crusher is required depends entirely on the type of turnings produced by the machine tools. Crushed turnings release oil particles more freely and require one-fourth the space that long, curly turnings occupy.

The chip extractor pours the oil whirled from the chips into a sump. This sump also receives the drain from the turnings loading platform. From the sump the oil is automatically pumped to a sedimentation-type sterilizing tank. There it is heated to a predetermined temperature by steam coils or electric heaters. A definite settling period allows the heavier dirt particles to drop into the sedimentation cone, which should be equipped with cleanout facilities. The oil is then decanted and pumped through a centrifugal oil purifier, which completely cleans and purifies the oil. It can then be pumped to a clean oil storage tank for redistribution by hand carts, or it can be pumped directly into the clean oil piping system that supplies each individual machine with its lubrication.

Paint Pipelines

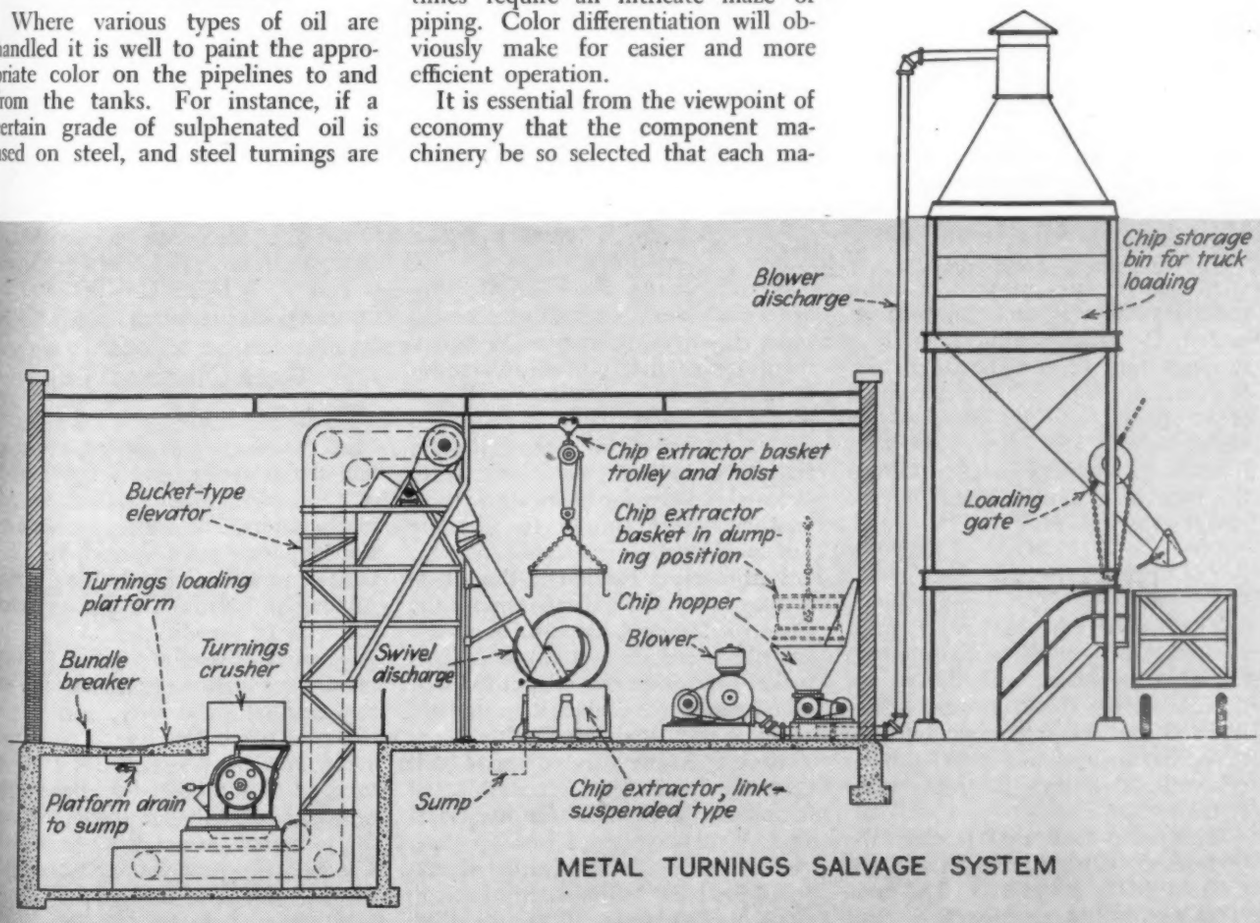
Where various types of oil are handled it is well to paint the appropriate color on the pipelines to and from the tanks. For instance, if a certain grade of sulphenated oil is used on steel, and steel turnings are being transported to the reclamation room in blue tote carts, it is logical to paint the piping to and from the sulphenated oil tanks the same color. This enables the operator to tell at a glance which valves to open and which to close. Systems handling four or five different types of oil sometimes require an intricate maze of piping. Color differentiation will obviously make for easier and more efficient operation.

It is essential from the viewpoint of economy that the component machinery be so selected that each machine functions in proportion with the others. The crusher should be of a size that will allow all the turnings produced in one day to be crushed in one or two shifts.

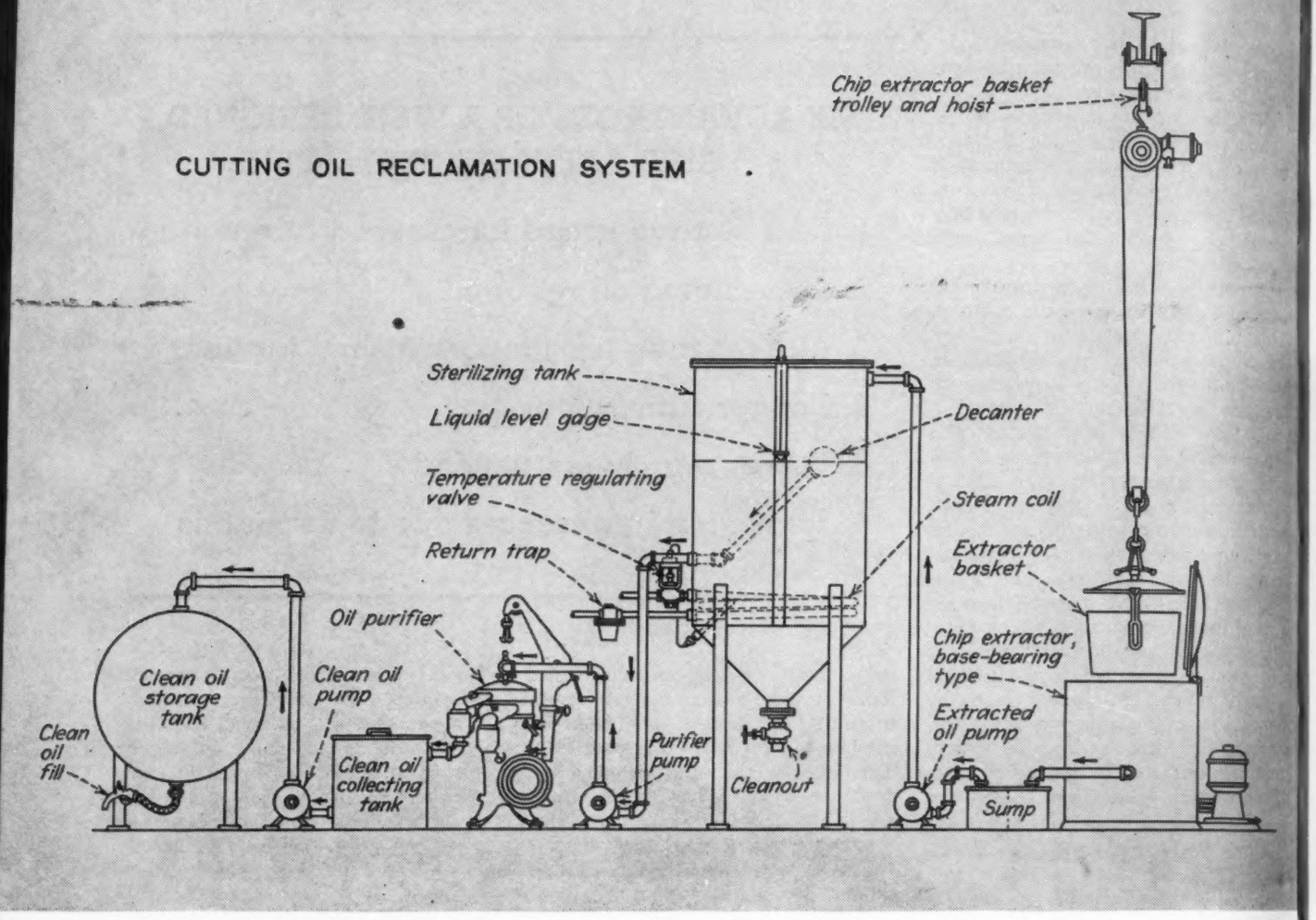
Extractor capacity may exceed that of the crusher, but should never be

SIX ADVANTAGES OF A WELL-DESIGNED CHIP SALVAGE SYSTEM

1. Less storage space for crushed turnings
2. Less cutting oil required
3. More money per ton for crushed turnings
4. Longer cutting tool life
5. Fewer man-hours needed
6. Reduction in absences due to dermatitis



METAL TURNINGS SALVAGE SYSTEM



less. Unless this precaution is taken, either the oily crushed turnings will pile up at the extractor or the crusher will have to be shut down. Either situation is, of course, wasteful. If uncrushed turnings are to be whirled, the increased bulk and the time required to balance a load of long turnings must be considered. Extractors are usually rated on the basis of so many loads per hour with a basket capacity of so many cubic feet. Extracting long turnings will cut down the number of hourly loads and the basket capacity.

Large Capacity

The purifier should have a rated capacity well over the anticipated reclamable gallonage, since the storage capacity of the sterilizer tanks is limited and provision may wisely be made to purify quantities of miscellaneous oils without shutting down the main system.

The sump tank that receives the oil from the extractor may be designed to hold 40 to 50 gallons. This tank is ordinarily equipped with a float switch to actuate the starter of the pump that discharges into the sterilizer tank. This pump prevents the sump tank from flooding, therefore nominal capacity is sufficient.

Sterilizer tanks and clean oil storage tanks should ordinarily be of the same capacity. It is wise to design them so that they provide storage for at least one day's reclamation. When several oils are reclaimed, more storage should be provided. This permits a full day's run of the oil purifier without a shutdown for changing over to another type of oil or for cleaning the equipment.

Furthermore, the longer the oil remains in the sterilizer tanks, the cleaner it becomes, because the heavier particles tend to settle out. This makes the job of the oil purifier that much easier and enables it to be used at its utmost rated capacity.

Each tank should be equipped with a telltale liquid level gage calibrated in gallons and designed for easy cleaning. A manhole on top of the tank and a handhole in the bottom should fulfill the latter requirement. In addition, the sterilizer tank should be equipped with a steam coil, temperature regulating valve, and a return trap if steam is available all year round. If not, immersion electric heaters can be substituted and controlled by a thermostat actuated by an immersion element.

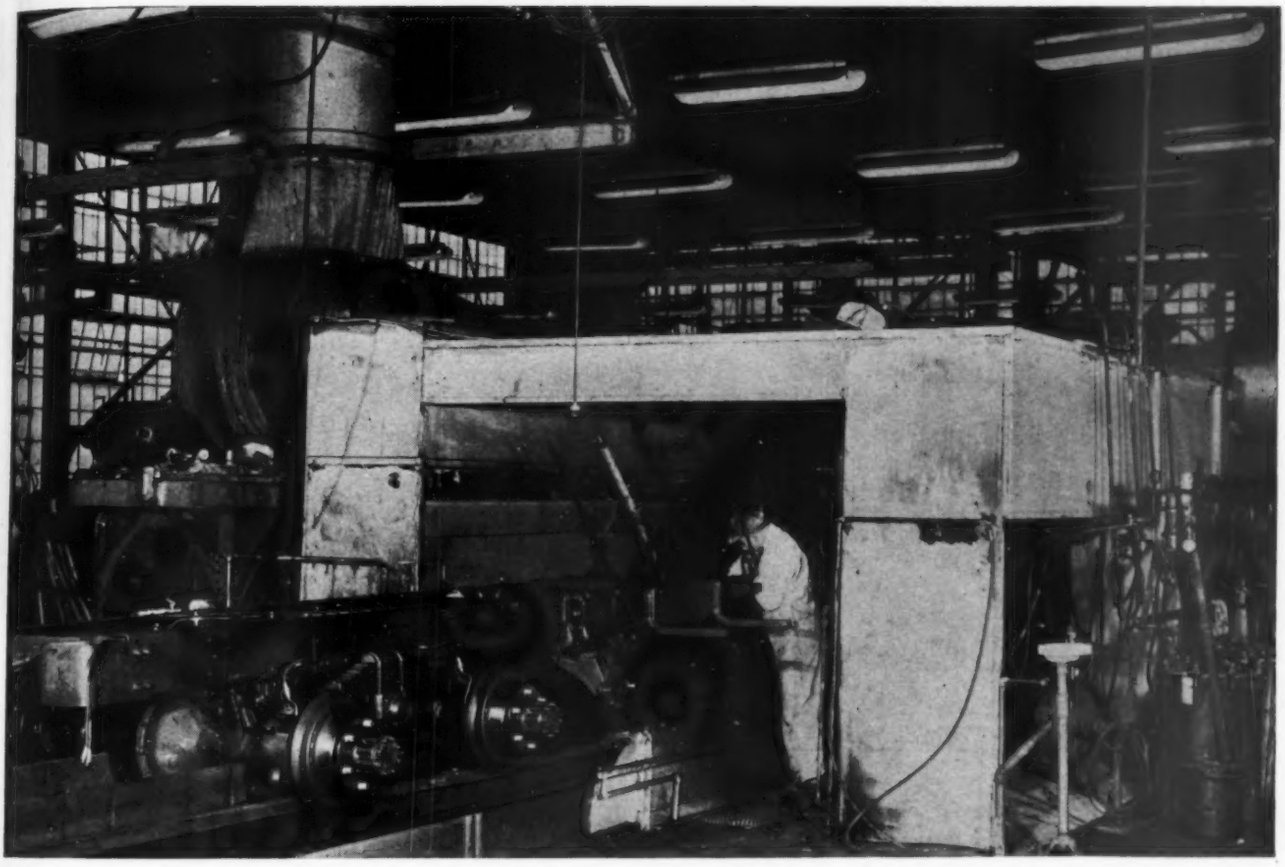
Gets Cleanest Oil

Each sterilizing tank should be fitted also with a decanting device so that the purifier receives only the hottest and the cleanest oil from the top of the tank. This device works on a floating, swing-arm principle. The purifier pump suction is then always submerged only a few inches below the level of the oil.

There is scarcely a metal-working plant for which a system of chip salvage and oil reclamation, such as the one described here or a variation, could not be designed. The advantages of this combination system are obvious, not only for today but also for tomorrow, when the war will be won and the peacetime wants of the whole world will be waiting to be filled by our factories.

Lighting an Old Plant for War Work

V. C. ULDIN, Plant Engineer, Studebaker Corporation, South Bend



Roof of the spray booth cuts off the overhead light, makes additional fixtures necessary. Special vapor-proof fluorescent lighting installed in the ceiling of the booth provides for adequate seeing

WITH AN INTENSIVE war production program ahead of us, it became necessary to convert one of our plants into a factory for making Army trucks. The plant best suited as to space and location had previously been used for miscellaneous spring manufacture and heat-treating. Its existing lighting system of filament lamps with reflectors, however, was insufficient and outmoded. While the light intensity of 6 foot-candles sufficed for the particular work carried on prior to war endeavors, it was at once apparent that a more modern, efficient system would have to be employed for the new precision work.

Several important factors entered into a decision for fluorescent lighting. Chief among these was that for other

The well-maintained plant is the high-production plant

considered systems it would have been necessary to use larger transformers and lighting feeders because of the inrush and load. This would have been costly. Although the initial cost of the fluorescent system approximated $25,000, it seemed the more economical solution in the long run.

The space to be illuminated measured about 570x154 feet. Assembly-line production was to be used, so an even flow of light to all parts of the factory was required. Since the installation was to be completely new and no established wiring had to be taken into consideration, the old plant was stripped of everything—machinery and all—and refitted for the new operation.

Five hundred seventy-six 200-watt fluorescent fixtures were installed at a 16-ft. mounting height on 12x13-ft. centers from ½-in. messenger cable. Lamps are supplied from a bus duct system. This installation produced an average of 33 foot-candles which has proved more than ample for good working conditions.

In a truck assembly plant, as in many other automotive factories, production must be geared to a given schedule. If a workman is compelled to take time out to connect and handle extension cord lights because some part of his work cannot be seen under

Light is of the utmost importance where production schedules must be met. Handling extension cords is time-wasting and dangerous. Here 200-watt fixtures at 16 feet produce an average of 33 foot-candles

the general lighting system, either production is slowed down or the work is inferior. Often inefficiency is charged to the workman when in reality it is the fault of the working equipment which has been provided for him.

To Concentrate Light

Every plant manager knows, too, the accident hazard to the plant personnel resulting from the use of extension cords. With the present fluorescent system, if some special work requires a higher intensity of light, it is necessary only to move a sufficient number of fixtures and plug them in. Rewiring, extra labor, and costly changes are eliminated.

Many plants engaged in war work are operating on two and three shifts. It is necessary to maintain the same production schedule for night as for day operation. The only way this can be done is to have the factory adequately wired to give the night workers the same good distribution of light. It is the lighting engineer's job to see that both night and day shifts have the proper amount of light.

One advantage of fluorescent lamps is in the smaller amount of heat given off. To maintain the light level produced by this fluorescent installation, other lamps would throw off so much heat that working conditions during the summer would be uncomfortable. With fixtures more than 6 feet above the workmen, little or no discomfort from heat has been felt. While this plant is not air-conditioned, fans are used and less heat from lighting equipment has a bearing on the number required. In other places where Studebaker uses air conditioning, it is found that the air conditioning load is reduced if fluorescent light is used.

In all precision work it is important that no shadows be created. Fluorescent lighting of sufficient intensity is assurance against shadows. Where it is necessary to identify numbers, such as piston ring numbers not legible with average light, fluorescent lamps enable the worker to read them without eyestrain.

In the plant's paint spraying booths, where it is necessary to use a roof as inclosure, this roof shuts out overhead light. Special fluorescent lights have been mounted in the ceiling of the booths to give the required light.

We have found that fixtures installed crosswise of the assembly lines, rather than lengthwise, reduce glare and produce more even distribution of light.

Better Housekeeping

We have noticed, too, that the men take more pride in their personal appearance in this factory than they did under the former lighting system. They keep themselves neater and cleaner. This pride extends to housekeeping. The men are doing a better job of keeping the plant in good order. Also their morale is improved. Almost every day some favorable comment on the lighting is made by the men.

ATTACK

IS THE BEST DEFENSE!

HERE'S HOW TO ATTACK YOUR BATTERY MAINTENANCE PROBLEMS

1. Keep adding approved water at regular intervals. Most local water is safe. Ask us if yours is safe.
2. Keep the top of the battery and battery container clean and dry at all times. This will assure maximum protection of the inner parts.
3. Keep the battery fully charged — but avoid excessive over-charge. A storage battery will last longer when charged at its proper voltage.
4. Record water additions, voltage, and gravity readings. Don't trust your memory. Write down a complete record of your battery's life history. Compare readings.

If you wish more detailed information, or have a special battery problem, don't hesitate to write to Exide. We want you to get the long-life built into every Exide Battery. Ask for booklet Form 1982.

Our strongest defense is a hard attack. That's an old Naval tradition now proving its truth on all the waters of the Seven Seas.

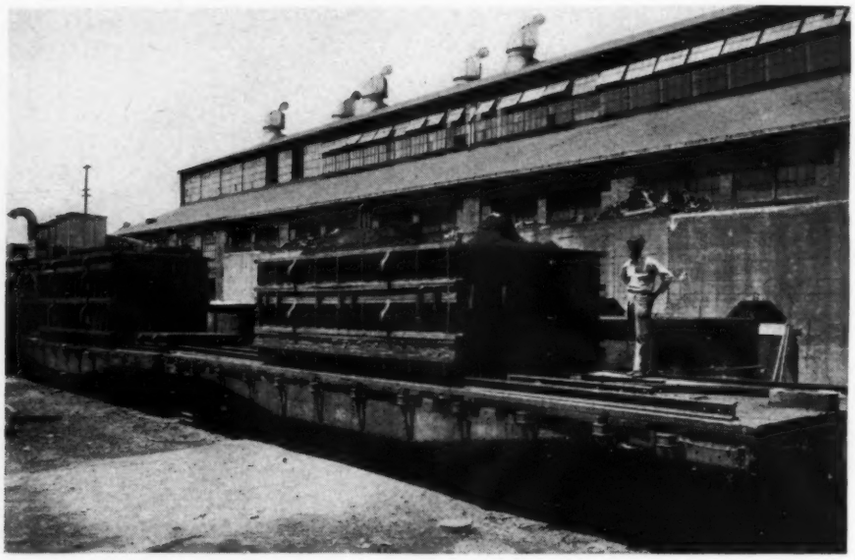
In similar fashion, the best defense against maintenance problems is a relentless, unceasing attack on carelessness and wear. Battery care, for example, is simplified if you observe four basic rules . . . which may be called your rules for attacking battery maintenance problems. Follow them faithfully, and remember, Buy to Last and Save to Win!

Exide
IRONCLAD BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

MAINTENANCE SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary maintenance accomplishments. Accepted articles will be paid for



Foundry floor space is released by allowing castings to cool out in the yard

Floor Space Released By Using Flat Cars

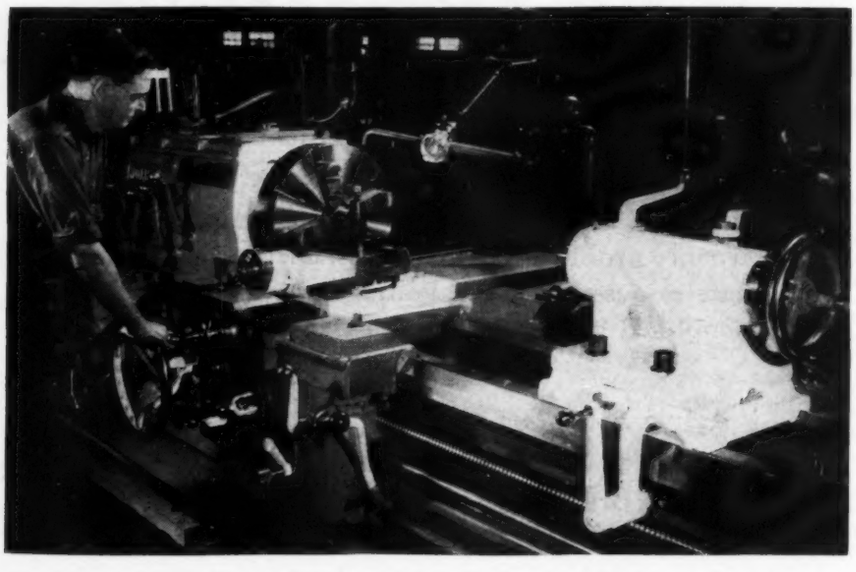
Under pressure of war production, Cooper-Bessemer Corporation, Mount Vernon, Ohio, could not permit its foundry floor to be crowded with huge flasks in which big castings were slowly cooling. A solution was found in some discarded flat cars with steel rails fastened to their floors.

In the foundry the flasks are placed on the cars, which are pulled outside and left until the castings cool. Then the cars are switched back into the foundry and the castings shaken out. Thus a considerable amount of floor space is released during the cooling period, permitting an increase in the foundry output.

Also, to conserve foundry floor space chipping and painting of many castings are done during the summer months outdoors, under a portable canvas covering that protects the workmen from the hot sun and light showers.

Some of the large castings, weighing more than 30 tons each, are loaded on special flat cars in the foundry and are chipped and painted in the yard, right on the car.

Careful scheduling makes it possible for a casting of this type to move from the foundry into the machine shop without leaving the special car until it is ready for machining and assembly.



Painting parts of this lathe with ivory enamel increased operators' incentive to keep the machine clean, and lessened eye fatigue caused by long hours spent on war work. Westinghouse East Pittsburgh works plans, on the basis of time study tests made, to paint other machine tools in like manner

Keeping Scored Pump Rods in Service

S. H. SLEMAN, New York

Here is a reciprocating pump maintenance kink that will help to keep pumps going when outages for repairs must be kept at an absolute minimum. It concerns pump rods that have become badly scored or scratched, are hard on packing, and lower the economy of the unit. These rods can be made to last a while longer in emergencies by applying a mixture of white lead and tallow to the roughened surfaces. The tallow causes the white lead to flow into the scores or scratches, where it will harden and, if applications are continued at intervals, the lead will finally build up until the surface of the rod becomes smooth.

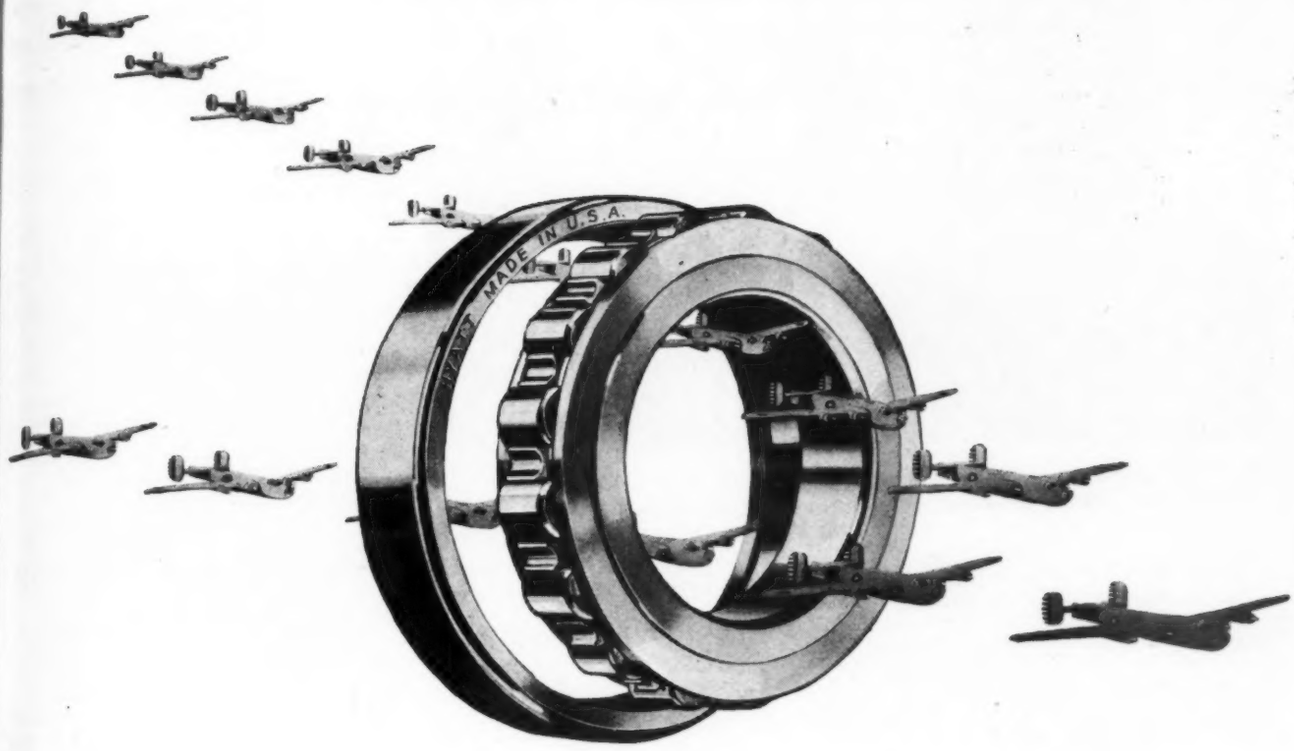
However, this treatment cannot be expected to fill up a rod that has become worn down. Such rods should be replaced as soon as possible. It is well to remember, too, that scored rods that have been treated with white lead are given this treatment as a temporary alleviating measure. Although their replacement can be postponed they should be renewed whenever operating conditions justify a sufficiently long shutdown.

Standby Power Speeds Machining

SOURCE—General Electric Company

Certain final hobbing operations in the manufacture of speed-reduction gears cannot be interrupted or subjected to appreciable speed variation without affecting the accuracy of the work, because differences in momentum tend to produce variations in the depth of the cut.

To guard against power failure or ex-



High Precision

The enormous striking power of America's eager, fighting planes comes largely from the amazing accuracy of their hundreds of precision parts.

Prominent among these parts are the smooth rolling Hyatt bearings into which we build great capacity while holding them true to required precision tolerances.

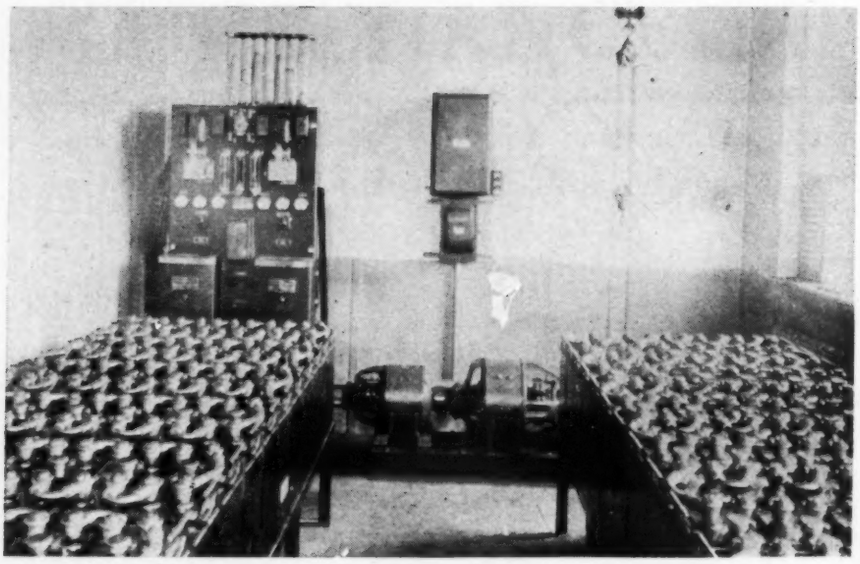
Ranging from hyper-quality large engine crankshaft bearings to relatively smaller super-smooth bearings for superchargers, Hyatt precision products faithfully serve the nation through the aircraft industry.

But, aviation is not the only field in which Hyatt Roller Bearings are battling the Axis.

Their proved performance under battle conditions in tanks, guns, ships and trucks . . . their round-the-clock operation in factories, on farms and railways . . . all reflect the many advantages of their high precision manufacture.

Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.

HYATT ROLLER BEARINGS



With this automatic standby equipment, regulation is so close that machine operators do not know whether power is coming from normal source or battery

cessive voltage fluctuation at a plant of the DeLaval Steam Turbine Company, it was decided to install a standby power source. The primary requirement was that the equipment have a capacity to supply the essential loads, ranging from 17 to 23 kw. (75 to 100 amperes at 230 volts), for not less than four hours. Experience showed that power failures would not extend beyond this length of time.

Other requirements were: Instantaneous and automatic transfer from standby to normal source and from normal to standby source; battery charge rate automatically varying from a trickle rate during standby periods up to more than normal rate following emergency discharge periods; and highest possible dependability.

An automatic power-supply system, consisting of a motor-generator set, a battery, and control equipment, was installed. The motor-generator consists of one 15-hp., 230-volt motor and two 5-kw., 50-volt generators. The motor is supplied by the normal source during standby periods and by the battery during interruptions in normal source. The generators, each in series with half (96 cells) of the battery, regulate the voltage during both charge and discharge.

The control panel is provided with meters, an undervoltage relay, disconnect contactors, and voltage regulators with their control equipment. Two carbon-pile regulators vary the field current of the generators through voltage control across the battery during charge and across the load during discharge.

Regulators perform the triple function of charging the battery at various rates from a trickle to more than normal; bucking the battery voltage during discharge when above the required load voltage; and boosting the battery voltage during discharge when it is below the required load voltage.

All regulation is automatic, and is so close that machine operators in the gear hobbing department do not know whether power is coming from the normal source or from the battery.

Alarm Indicates Tie Line Overload

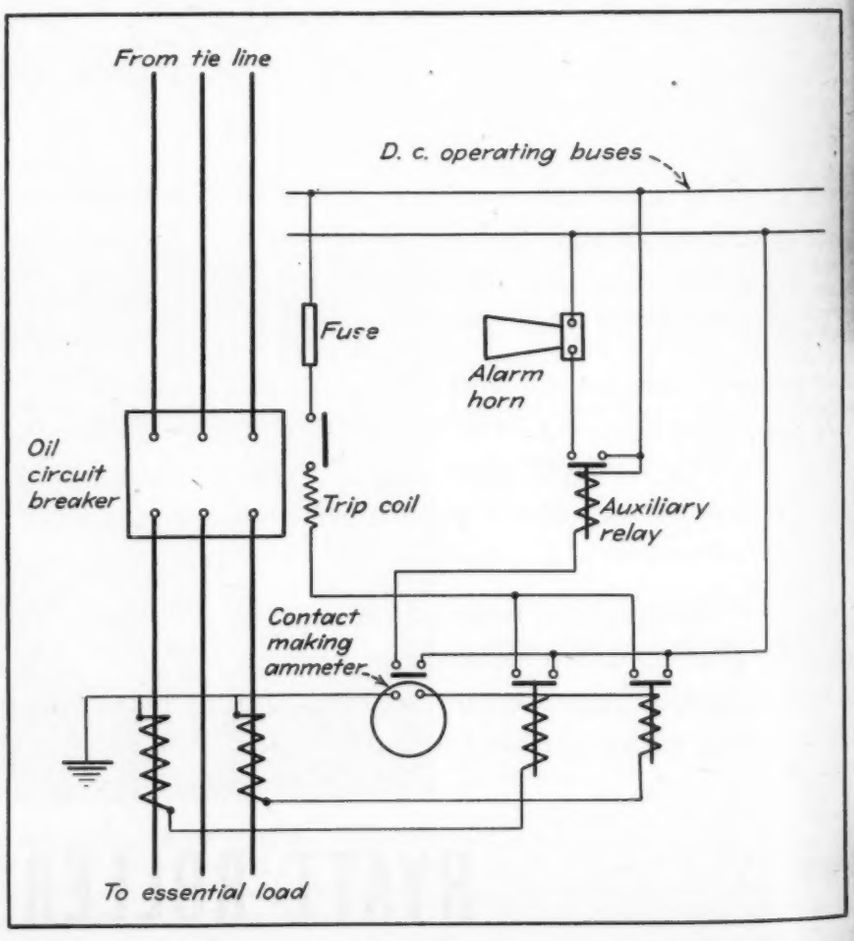
S. H. COLEMAN, Staunton, Va.

Normal power requirements of our plant are supplied by our own steam-generating station. In designing this station, however, it was found economical to dispense with an emergency gasoline- or diesel-engine-driven standby generating unit, and in its place substitute an emergency power source made available through a power interchanger agreement with a public utility.

Dependence on this emergency power source is limited to the current required when bringing our own station up from a cold start; aiding in restoring electrical services in the event of a station interruption; insuring continuity of steam production; and supplying certain essential motors in production areas which, if shut down for any reason, would cause heavy financial loss. However, capacity of the tie line with the utility substation is insufficient to handle all these demands unless a careful balance is maintained between steam and electrically driven auxiliaries in the power plant.

Although the tie line and its primary transformers could easily handle overloads of considerable magnitude for short periods of time, this practice is naturally frowned upon, since failure of the tie line while in service would have disastrous repercussions. So, in order to warn the power plant operating staff that the load on the tie line is exceeding a predetermined safe limit, an alarm system is provided.

As shown in the wiring diagram this system comprises a contact-making ammeter set at a point 25 percent below the setting of the tie line overcurrent oil switch tripping relays. When this ammeter makes contact it closes a supplemental relay which energizes a magnetic warning horn audible throughout the power plant.



NO. 2 OF A SERIES

HOW TUBE-TURN WELDING FITTINGS BENEFIT WAR INDUSTRY

★ The ★ FIRST WELDING FITTINGS 1ST AND STILL THE BEST

Two ways that Tube-Turn welding fittings avoid wasting men and hours in war plants!

1 SPEED-UP PIPING INSTALLATION

2 GREATLY REDUCE MAINTENANCE

Faster installed, trouble-free piping steps-up production schedules!

TUBE-TURN fittings speed up piping installation four ways: (1) Need only butt-welds, easy for veteran or novice welders. (2) Less lining-up, for fittings have *uniform* walls and true circularity. (3) Sections preassembled on the ground save time. (4) Torch cutting and fabricating are eliminated. Tube-Turn fittings are ready to weld—types, sizes and weights for all needs.

You can depend on piping welded with Tube-Turn fittings to be practically maintenance-free, as Tube-Turn welding fittings give the *greatest possible strength* and *long life*. They're *permanently leakproof*. There are no bolts to loosen, no gaskets to replace, no threads to corrode and weaken.

No plant *ever* can afford a break-down or production slow-up, but in war-time it's a disaster! The best insurance in the world against trouble in piping systems is *welding with Tube-Turn fittings!*

OTHER WAR-TIME ADVANTAGES:

SAVES CRITICAL MATERIAL: Absence of many flanges, bolts, nuts and heavy cast steel construction saves many tons of metal in a single piping system.

FASTER AND EASIER TO INSULATE: Tube-Turn fittings are insulated as easily as the pipe itself, for the welds form one continuous tube.

SAVE SPACE: Pipe systems welded with Tube-Turn fittings permit streamlined, compact layouts and sharp angles.

LAST LONGER: Smooth inner walls—with no ridges, waves or scale—means less corrosion and longer life.

LESS PRESSURE LOSS: Because of full effective radius and exact O.D. and I.D. alignment with the pipe, the flow is more efficient and pressure loss is less.

FEWER SUPPORTS NEEDED: Since welded piping weighs less and stands vibration better than flanged systems, few hangers or supports are required.

TUBE TURNS, (INC.) LOUISVILLE, KY. ● *Branch Offices:* New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Dayton, Washington, D. C., Tulsa, Houston, Los Angeles. ● *Distributors in principal cities.*

TUBE-TURN TRADE MARK *Welding Fittings*

Relay and Switch Upkeep and Trouble Shooting

Relays

Frequency of inspection depends a great deal on local conditions, type of installation, and operating duty. The primary function of protective relays is to protect. Out-of-order or inoperative protective devices are useless. The maintenance of the relays, to keep them in working condition is most important.

A general check of all relays should be made at least once per year, or whenever there is reason to doubt their reliability or adjustment.

Test precision and high-speed relays every six months. Inspect relays equipped with leather bellows, oil dashpots, or the like, every six months.

Parts to Check and What to Do

General

Check all relays. See that all covers are in place and in good condition, with no broken glass parts, no loose or missing nuts, and no accumulations of dust or dirt. They should be examined and tested at least once a year by a relay technician. Manufacturers' service shops can usually supply this service. It is inexpensive insurance.

Contacts

See that the contacts align properly, that they are clean and bright and free to operate. Dirty, or slightly pitted contacts should be cleaned by scraping the surfaces lightly with a sharp knife or by using a fine, clean file. Emery or crocus cloth must not be used on silver contacts. Don't touch contact surfaces with the fingers.

Moving Parts

Keep moving parts of the relay free from anything that impedes their movement. Remove dirt and dust. If the movement is sluggish or impeded by a defective jewel bearing, the bearing should be removed and the jewel inspected. The jewel should be wiped carefully and examined with a microscope. A cracked jewel can be detected by moving the point of a pin or a fine sewing needle lightly over its surface. Defective jewels should be replaced with new. Insert new steel pivots at the same time.

Lubrication of relays is seldom required. A drop of oil, such as will cling to the point of a fine needle, should be applied to a new jewel. Use only the finest grade of meter-jewel oil.

Operation Targets

When relays are provided with targets to indicate operation, see that they are all in proper functioning condition, with target coils of correct current rating to operate on the minimum available tripping current.

Quiet Operation

See that each relay is quiet in operation. If noisy, examine for loose parts. Make sure that all screws and nuts are in place and tight.

Connections

Connections should be traced and checked to assure that they are intact and tight.

Insulation

The insulation of relay and connections should be inspected, and dielectric tests made.

Time Features

Where the relay is provided with time features, time settings should be checked.

Examine and dress leather (or equivalent) bellows to keep them pliable and in good condition.

Oil-film or oil-dashpot features require checking. See that the oil is clear, of the correct amount, not gummed, and that all functioning conditions are correct. Plastic parts should be cleaned with non-solvent fluids.

Tests

(a) *Calibration tests*—Check each relay element for current, potential, and power at pick-up, drop-out, and intermediate points.

(b) *Time-settings check*—Operate relays under simulated overcurrent (or other type of fault against which relay is designed to protect) conditions.

(c) *Tripping test*—Trip the power circuit breakers by the actual operation of the relay (the relay operated, by test, electrically with cover in place). This checks the relay, the tripping circuit, and the operation of the breaker. (*Continued on page* 136)

Prepared by WAYMAN A. HOLLAND, Switchgear Division, General Electric Company

BIG-HUSKY-ACCURATE *is not enough!*

You've got to consider the "X" factor, too!

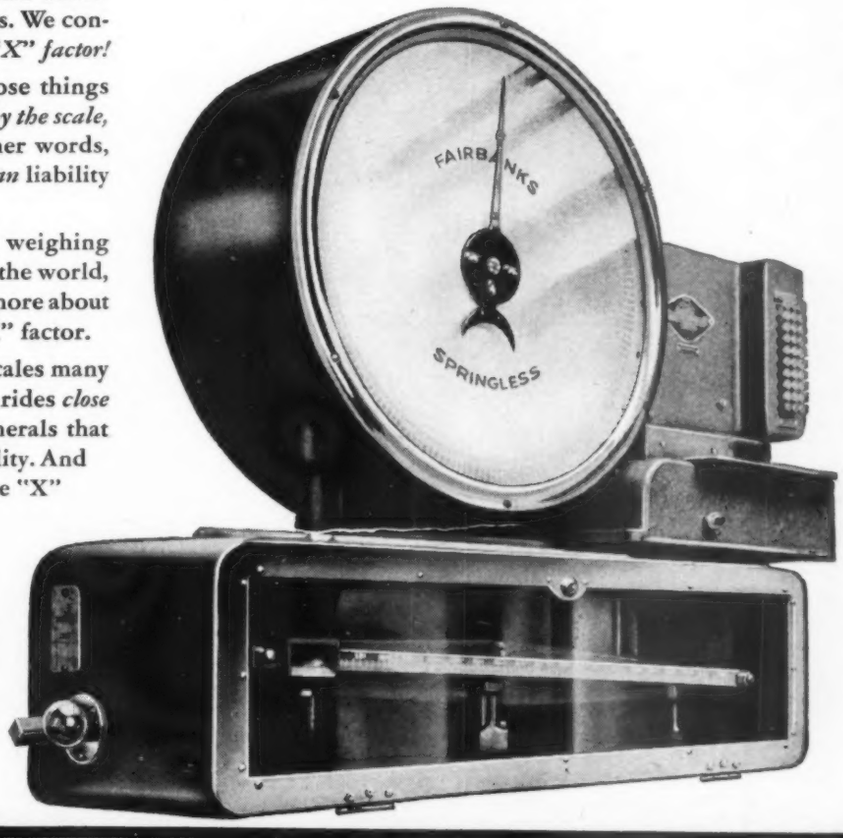
Sure, we make scales big, husky, and accurate. You've got a right to expect *that* from *any* good scale. But we at Fairbanks-Morse build something else into our weighing machines. We consider in the *design* of our scales—*the "X" factor!*

The "X" factor is composed of those things which cause inaccurate weighing, *not by the scale,* but by the men who use scales. In other words, the "X" factor in weighing is the *human* liability of inaccuracy.

Having designed and manufactured weighing equipment longer than anybody else in the world, it is only natural that we should know more about the causes of inaccuracy due to the "X" factor.

Consequently, you will find in our scales many little features, such as a pointer which rides *close* to the dial to avoid parallax, and numerals that have been selected for greatest readability. And if you want to completely eliminate the "X" factor, we'll provide a ticket printer which prints an indelible record, automatically.

If you have a weighing problem, or want to speed up your weighing operations, come where there is more experience. Ask Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago.



Fairbanks-Morse Scale Engineers, because they are industrial specialists, can be of greatest service in fitting weighing machinery into your production flow. For weighing while in motion, secrecy in weighing, or automatic operation, ask for their counsel.

FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
ELECTRICAL MACHINERY
SCALES
MOTORS

WATER SYSTEMS
FARM EQUIPMENT
STOKERS
AIR CONDITIONERS
RAILROAD EQUIPMENT

FAIRBANKS SCALES

Scales

Relay and Switch Upkeep and Trouble Shooting *(Continued from page 134)*

Troubles and Their Remedies (Relays)

It is impractical to give in detail rules for carrying out all the remedies given. Such information must be obtained from the manufacturers' instruction books.

Trouble	Cause	Remedy
Failure to operate properly under fault condition	Incorrect calibration setting	Test relay and set according to the protective requirements of the circuit
Failure of contacts to provide operation of associated power circuit breaker, or other device	Contacts out of proper adjustment	Adjust contacts and contact supports to make proper contact
	Contacts dirty or burned and pitted	Clean by scraping the contact surfaces lightly with a sharp knife, or by using a fine clean file. Do not use emery or crocus cloth on silver contacts
Movement of relay parts sluggish or retarded	Caked or dried oil, or accumulation of dust	Clean and inspect more often to avoid a recurrence
	Cracked jewel	Replace with new jewel, inserting a new steel pivot at the same time. Handle relay carefully, avoiding jar or shock
Failure of operation target to indicate	Insufficient contact circuit current to operate target	Substitute a more sensitive target operating coil
	Accumulation of dust or dirt prevents dropping down of target	Clean target mechanism and inspect more frequently to prevent a repetition
	Improper setting of operating armature	Relay should be adjusted by a relay technician
	Mechanical binding in target linkage	Manufacturers' service shops are equipped for this service

Switches

All switches should be examined periodically, and while those on switchboards and under the more or less constant care of operators get at least superficial daily attention, those mounted in more isolated locations, where they are less frequently operated and seldom seen, should have a general check at least once every year (or oftener when the conditions require it).

Parts to Check and What to Do

General

The switchboard itself should be cleaned regularly preferably with a vacuum cleaner with an insulated suction nozzle. This can be done while the board is alive if care is exercised. Never wipe dull finished surfaces.

Inspect internal parts of metal-inclosed switchgear. Remove accumulated dust, and clean insulators. When switch parts are "dead" they should be solidly grounded before being touched.

Never open or close a disconnecting switch unless the circuit is open at some other point.

Contacts

See that the blades make good contact. Insert a 0.002-in. feeler gage between the blade and the contacts. If the gage can be inserted, adjustments should be made. Do not attempt to grind blades into good contact by abrasives. Such practice inevitably results in poor contact and overheating. Switches provided with silver-to-silver contact surfaces seldom require dressing. Make sure that contact clips have not been annealed by overheating.

Heating

Be sure that switches are not overheating with full-load currents, or that fuses or connecting conductors are not feeding heat into the switches (or are not in themselves overheating). Overheating may often be detected by discoloration of current-carrying parts.

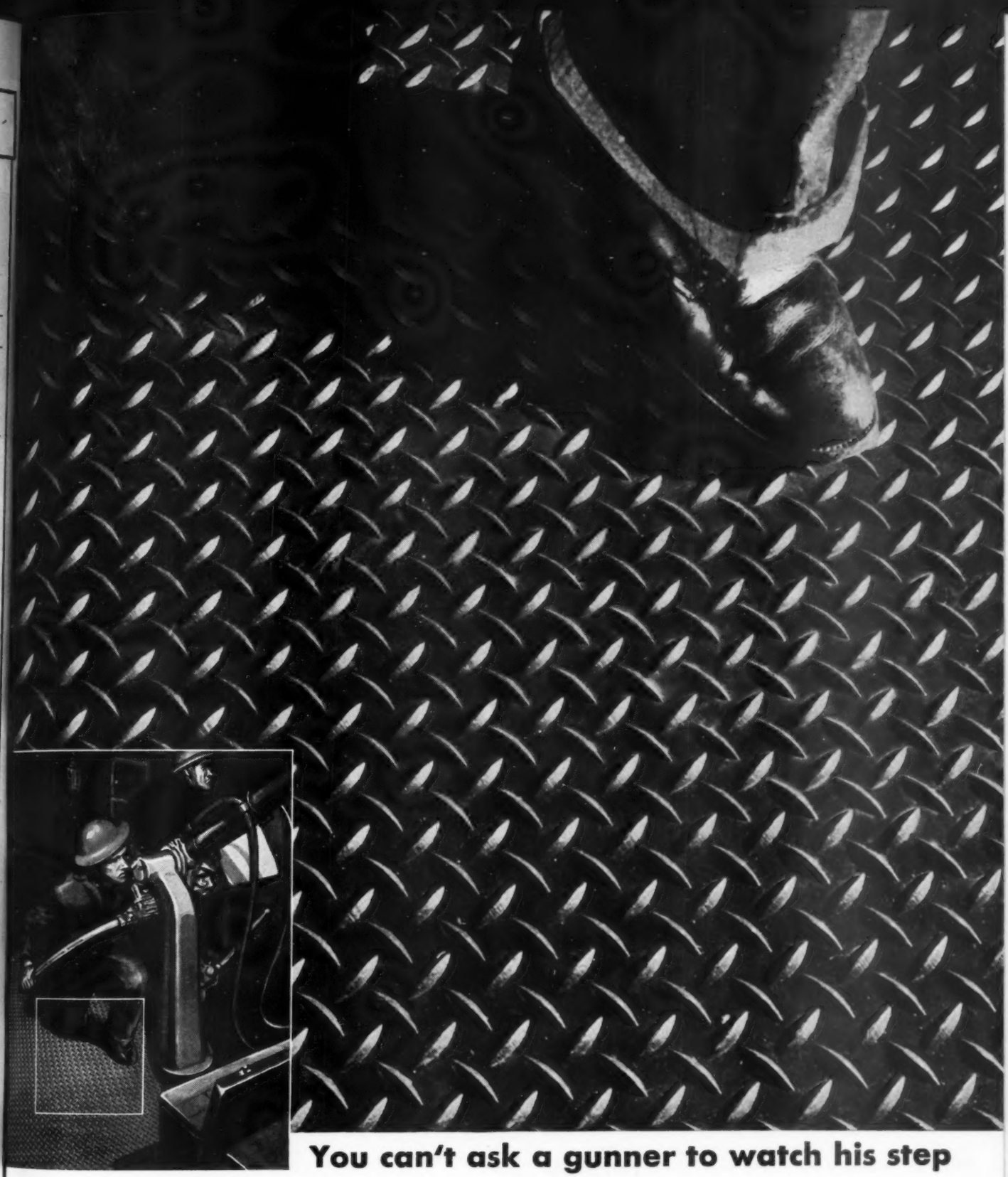
Nuts and Screws

Check nuts and screws. Are they in place and tight?

Cables and Connections

Check terminal connectors, cables, and connection bars to the switch for condition and temperature.

(Continued on page 138)



You can't ask a gunner to watch his step

Uncle Sam braces gun crews for battle on "A.W." Rolled Steel Floor Plate. Guards against dangerous slipping and falling accidents. "A.W." Floor Plate protects men essential in the war effort wherever they may be—in war production plants, refineries, power plants; in tanks, troop-carrying trucks and on shipboard. Toughest wear will not damage or impair it. Ends floor troubles for good. Write for folder.

ALAN WOOD STEEL COMPANY

MAIN OFFICE AND MILLS: CONSHOHOCKEN, PENNSYLVANIA : SINCE 1826. District Offices and Representatives: Philadelphia, New York, Boston, Atlanta, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Houston, St. Paul, New Orleans, Pittsburgh, Roanoke, Sanford, N. C., St. Louis, Los Angeles, San Francisco, Seattle, Montreal.

Relay and Switch Upkeep and Trouble Shooting *(Continued from Page 136)*

Parts to Check and What to Do (Switches, cont.)

Fuses

Check all fuses. Be sure that they are of the proper rating. Check fuse clips for good contact. See that clips have not been annealed by overheating.

Inclosed Switches

Check inclosed switches, especially safety switches. Examine inclosure, operating handle and mechanism cover and interlock, full-load current, accessibility, and switch-box ground connection.

High-Voltage Disconnecting Switches

Surfaces of insulators must be clean, especially where cement or metallic dust, salt spray, or acid fumes prevail.

Miscellaneous Parts

A general check and inspection should be made at least once every year. A definite schedule for this work will be determined by local and operating conditions. This inspection should be conducted even on switchboards that are under the care of constantly present operators.

Parts to Check and What to Do

General

All switches should be thoroughly cleaned, periodically, and a light coat of lubricant (vaseline or the like) applied to the contact surfaces. Do not use cup or other grease which may harden upon exposure to air. All switches should be opened and closed occasionally. *Do not* come in contact with live parts. These precautions are essential where metallic dust, cement, fine powdery dust, salt spray, or acid fumes prevail.

Meters and Instruments

The instruments should be examined. See that all are in good condition, registering properly, have no broken or cracked glass or cases, or are not otherwise defaced or damaged.

Watthour meters should be tested and calibrated.

Meters should be examined and tested once a year by a meter technician. Manufacturers' service shops can usually supply this service.

Voltage Regulators

Check and readjust voltage regulators.

Control and Transfer Switches

Check the operation of all infrequently used control and transfer switches, inspect contacts and repair or replace damaged parts. This inspection should include the operation of the controlled device.

Indicating Lamps

Examine indicating lamps and replace weak ones. The operation test of controlled devices should include checking the proper indication of the open and closed postiions.

Test Blocks

The test blocks should be examined—contacts in good condition, no cracked cases or covers, no loose connections. Repair or replace any damaged parts.

Position-Changing Mechanism

The position-changing mechanisms of metal-clad, draw-out-type inclosed switchgear should be inspected and tested to assure their condition and operation. They should be properly lubricated. Do not permit overtravel.

Rheostat Mechanisms

If rheostat mechanisms do not operate easily, lubricate.

Busbars and Connection Bars

Busbars and connection bars should be examined for proper condition. If overheated, the cause of overheating should be found and corrected. It may be due to loose connections, or overload. Loose bolts and nuts in bolted joints should be tightened. Dismount overheated joints, clean the surfaces, smear with inert grease (or slushing compound), and reassemble.

Instrument Transformers

Inspect instrument transformers, primary and secondary connections, and potential transformer fuses; test grounding, both frame and secondary.

Shutters and Interlocks

The safety shutters in metal-clad switchgear should be checked for correct operation and position. All interlocks should be inspected and checked.

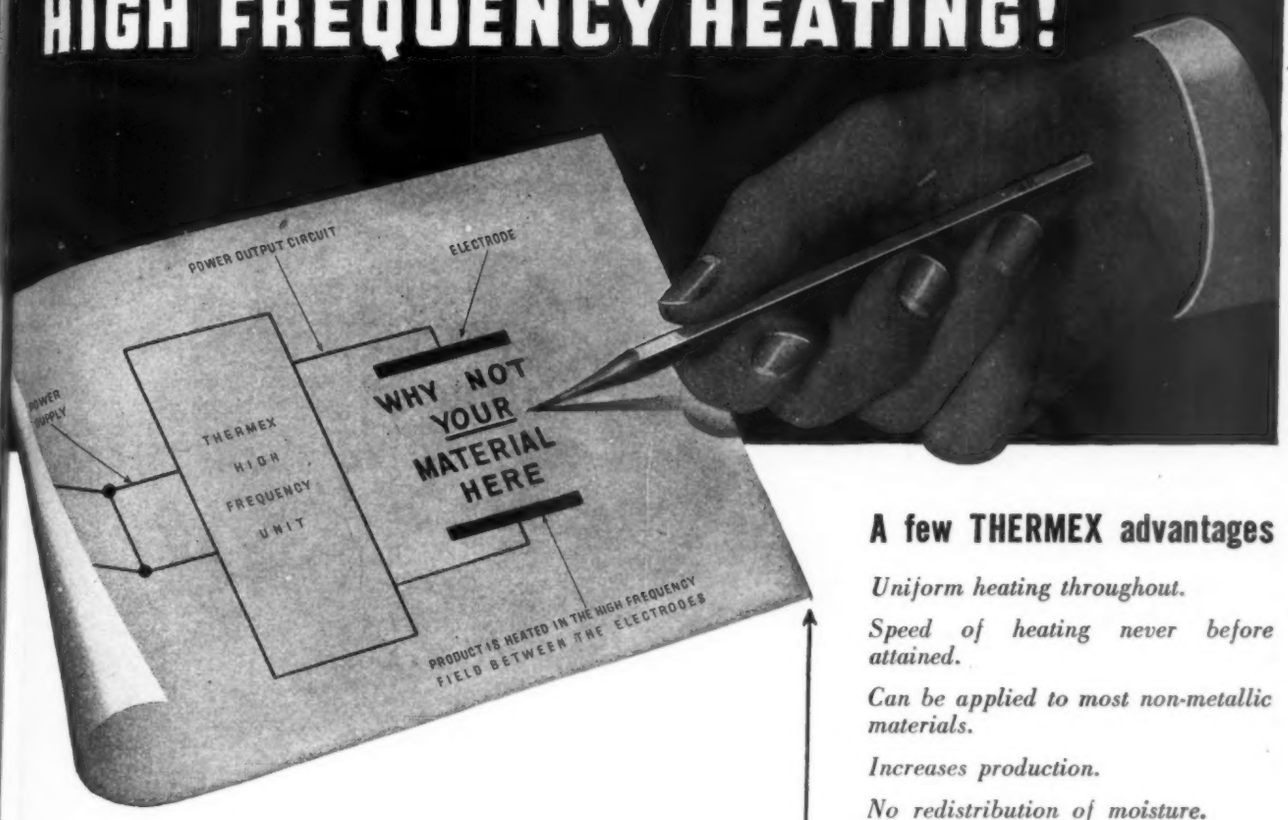
Insulation (Dielectric Test)

A dielectric test should be made to check the adequacy of insulation. This test is advisable after an abnormal occurrence, such as fire, flood, etc., when there may be some doubt as to the practicality of replacing or of continuing the equipment in service.

(Continued on page 140)

Want faster, uniform drying, bonding or heat processing?

INVESTIGATE THERMEX HIGH FREQUENCY HEATING!


POWER OUTPUT CIRCUIT
ELECTRODE
POWER SUPPLY
THERMEX HIGH FREQUENCY UNIT
WHY NOT YOUR MATERIAL HERE
PRODUCT IS HEATED IN THE HIGH FREQUENCY FIELD BETWEEN THE ELECTRODES

Thermex heats non-conducting materials faster and uniformly

If your production involves drying, heat processing or bonding any non-metallic substance, then you will be vitally interested in Thermex.

Thermex is the *first practical, proved equipment* for industrial use employing high frequency electrostatic heating.

There are so many advantages to this type of heating over all other known methods that you are urged to investigate the possibilities of Thermex in your plant.

Heating is absolutely uniform regardless of the thickness or mass of material. Heat is generated *within the substance* at a rate never before possible. There is full control at all times—heating may be stopped instantly, or increased or decreased by the twist of a dial.

Send for new illustrated booklet describing how Thermex can help war production, its advantages, application, and simple operation. Fill in and mail the handy coupon *now*.

A few THERMEX advantages

Uniform heating throughout.

Speed of heating never before attained.

Can be applied to most non-metallic materials.

Increases production.

No redistribution of moisture.

Less handling required.

Reduces labor costs.

Handles wide variety of jobs with high efficiency.

Results may be reproduced without variation.

No surface damage or danger of overheating.

Heating may be stopped immediately.

No "hot plates" or steam required.

Wide range of sizes for all requirements.

SEND FOR BOOKLET *Now!*

The Girdler Corporation
Thermex Division
217 E. Broadway, Louisville, Ky.

Send us your free booklet on Thermex High Frequency Heating:

Name_____

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The GIRDLER CORPORATION

Thermex High Frequency Electrostatic Heating Equipment

THERMEX DIVISION . LOUISVILLE, KENTUCKY

Relay and Switch Upkeep and Trouble Shooting *(Continued from Page 138)*

Miscellaneous Parts

Troubles and Their Remedies

Trouble	Cause	Remedy
Watthour meters inaccurate	Meter may be dirty, or choked with dust or magnetic particles. May have a cracked jewel, rough bearing, bent disk, improper clearance, marred gears or worm meshing, damaged coils, loose connections	Clean meter, or repair the faulty parts, test and calibrate
Meters failing to register	Blown potential transformer fuse	Renew blown fuses
	Broken wires	Repair broken wires
	Wedge or block to keep disk from moving during handling of meter	Remove and see that meter is in good operating condition
Damaged control transfer switch, or test blocks	Burned or pitted contacts from long use without attention, or from unusual conditions	Dress or clean burned contacts or replace with new contacts if necessary
Relays failing to trip breakers	Improper setting	Adjust setting to correspond with the circuit conditions
	Dirty, corroded, or tarnished contacts	Clean contacts with knife or fine file. (Do not use emery or sandpaper)
	Contacts improperly adjusted	Readjust so that contacts close with proper amount of wipe
	Open circuits, or short circuits, to relays	Check to ascertain that voltage is applied and current is passing through the relay
	Improper application of target and holding coils	Target and holding coils should correspond with tripping duty of breaker to assure proper tripping
	Faulty or improperly adjusted timing devices	(1) If of bellows or oil-film type, clean and adjust (2) If of induction disk type, check for mechanical interference, and adjust
Noises due to vibration of parts	Loose bolts or nuts, or inadequate supports, permitting excessive vibration	Tighten loose bolts and nuts. Strengthen or repair inadequate supports
	Loose laminations in cores of transformers, reactors and coils	Check all nuts and clamps and tighten any that are loose. Tighten core clamps
Connections overheating	Increase of current due to additional load beyond normal current rating of bars or cables	Overheating caused by overload can be remedied by: (1) Increasing the carrying capacity (2) Removing the excess current
	Bolts and nuts in the connection joints not tight	Tighten all bolts and nuts
Failure of instruments and devices having potential windings	Loose connection at terminals (due to loose nuts or binding screws, or to broken wire)	Tighten all loose connections, or repair broken wire circuits
	Blown fuse in potential transformer circuit	Renew fuses
	Open circuit in potential transformer primary or secondary circuits	Repair open circuit and check entire circuit for condition

Flood casualty YESTERDAY

OK'd for Service on the Production Front Today

FLASH FLOODS "SOMEWHERE IN U.S.A." 48 TONS OF ELECTRICAL EQUIPMENT WATER-SOAKED, UNFIT FOR SERVICE. RUSHED TO WESTINGHOUSE MANUFACTURING & REPAIR PLANTS, DRIED IN ELECTRIC OVENS, RECONDITIONED, INSPECTED, TESTED...WITHIN 24 HOURS MANY OK'd MOTORS WERE ON THE RETURN TRIP—WITHIN 10 DAYS ALL EQUIPMENT RESTORED TO SERVICE.

Westinghouse
MANUFACTURING AND REPAIR

J-90462

***IF* THE EQUIPMENT NEEDING REPAIR IS VITAL TO THE WAR EFFORT . . . PHONE THE NEAREST OFFICE OF WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY FOR**

EMERGENCY SERVICE

33 M & R PLANTS . . . ONE NEAR YOU!

Honoring the Men and Women of Warren Webster & Co.

"..for outstanding achievement in producing war equipment"

On December 12th, 1942, Robert P. Patterson, Under Secretary of War, addressed the men and the women of Warren Webster & Company in praise of their work on war production and announced the award of the Army-Navy "E" to the Webster Organization. Mr. Patterson wrote:

"This is to inform you that the Army and Navy are conferring upon you the Army-Navy Production Award for outstanding achievement in producing war equipment.

"The award consists of a flag to be flown above your plant, and a lapel pin which every member of Warren Webster & Company may wear as the mark of an inspiring contribution to the future of our country.

"Your accomplishment during the past year has set a high standard of practical patriotism, yet the Army and Navy are confident that your record in the future will raise that standard even higher."

This badge of honor will be worn proudly by every employee of Warren Webster & Company. It is a daily reminder that their production at high rate and quality is urgently needed for Victory . . . production of Ordnance materials for our fighting men . . . production of Webster Steam Heating Equipment for Army and Navy buildings, war plants, ships and other essential uses.

Warren Webster & Company, Camden, N. J.
Pioneers of the Vacuum System of Steam Heating
Representatives in principal U. S. Cities

Webster
Steam Heating

YOU WANT TO KNOW

more about the items mentioned on this page

Letters to the addresses given will bring information

• EMERGENCY SPECIFICATIONS and test methods to conserve and standardize critical materials are now being issued by the American Society for Testing Materials, 260 South Broad St., Philadelphia. Specification ES-20 covers malleable iron flanges, pipefittings, and valve parts, including parts to be assembled, manufactured in advance, and supplied from stock by the manufacturer or distributor. Evaluating of exterior paint of the linseed oil type is treated in publications D259, D660, D661, D662, and low boiling solvents in D657. 25¢ each.

• IF YOU WANT A DIRECTORY to the U. S. Government, OWI puts out such a manual at $1. Its 700 indexed pages detail the legislative powers, functions, location, and names and titles of chief officials of government departments and agencies. A list of current government publications, organization charts, and a section on abolished and transferred agencies and functions included. Available at U. S. Information Center or from Superintendent of Documents, Washington, D. C.

FLOOR MASK that goes on like paint, dries to a hard, durable, nonskid surface. Duramask forms a protective coating against paint, oil, grease, resins. Scrubs off with water. Used to protect machinery, walls, workbenches. Noncorrosive, noninflammable. Turco Products, Inc., 6135 S. Central Ave., Los Angeles

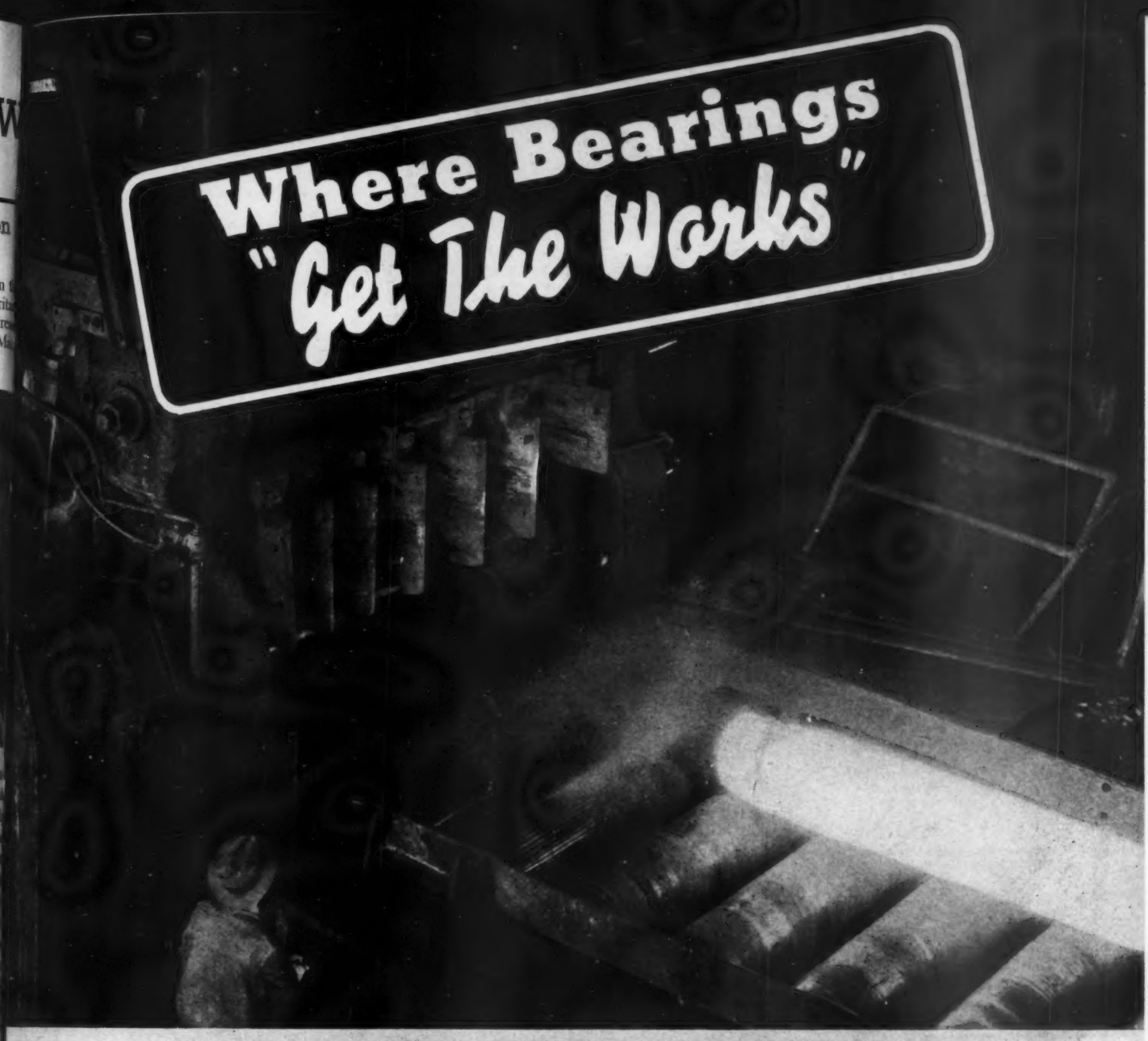
• PROTECTION AGAINST STAINS, Hecto Creme is applied to the skin before work with aniline stains, dyes, and inks. Resulting invisible film, which can later be removed with water, is supposed to absorb stains and prevent skin contact. As a buffer against solvents, Waterproof Creme can be used. Rubbed in the nostrils it gives relief also from irritating fumes, vapors, and dusts. Cadet Creme Co., 151 Farrar Ave., Worcester, Mass.

CHIC PROTECTIVE HELMET of transparent Lumarith plastic and net designed and labeled by Lilly Dache. Loose hair is kept safely and neatly in bounds, protected from dust and oil. The helmet is lightweight, ventilated for cool comfort. Easily kept clean with a damp cloth, it is unaffected by oil or grease, changes in temperature, and is noninflammable. Said to enhance beauty of blondes, brunettes, redheads. Available from Mine Safety Appliances Co., Pittsburgh, or B. F. McDonald Co., Los Angeles

• COTTONLEATHER is the name of a material developed by Southern Friction Materials Co., Charlotte, N. C. It's a dark tan, leather-like stuff, semi-flexible, dense, durable. Made of chemically treated multi-ply fabric, cottonleather is available in sizes 1x$\frac{3}{32}$ in. to 6x$\frac{1}{8}$ in., and comes in planks, strips, or rolls. Uses suggested are motor mountings, pipe and hose clamps, shock-absorbing blocks, anti-squeak webbing, friction material.

• VISUAL LEARNING GUIDES for use with the U. S. Office of Education training films on machine shop work, test learner's knowledge of what he saw or heard in the film. Sold in packages of 50, cost $1.45. National Audio-Visual Council, 160 N. LaSalle St., Chicago.

• STEEL CABLES are being used instead of the usual cords or fabric in conveyor belts carrying iron ore to blast furnaces. At one mine these belting lifts are 240 feet in a 1100-ft. conveyor in one



SUN H. D. LUBRICANTS

"Do a Job"... Under Pressure, Heat and Water

In one of the country's largest steel mills, now turning out materials for tanks, guns and ships, Sun Heavy Duty Lubricants are helping to keep equipment on the job and producing at top speed.

For many years operators in this plant thought expensive lead soap and graphite greases were necessary for lubricating the roll neck bearings of blooming mills. But this practice was soon abandoned when Sun Engineers—those Doctors of Industry—recommended Sun Heavy Duty Pressure Grease. Now these lubricants stand up under extreme pressures, high heat, and water constantly flooding the rolls. Bearings show little or no signs of wear . . . lubricant does not wash off . . . and lubricant lines are never clogged as was often the case with products previously used.

Today, in this plant Sun Lubricants are standard throughout . . . in pressure systems or hand lubricated installations . . . from bar mills to conveyors. Whether you operate a steel mill or a textile mill . . . a machine shop or a munitions plant there's a Sun Lubricant to meet your requirements. And Sun Oil Engineers always stand ready, willing, and able to help you help America with more production. Write . . . .

SUN OIL COMPANY, *Philadelphia*

Sun Oil Company, Limited, Toronto, Canada

SUNOCO

SUN PETROLEUM PRODUCTS *HELPING INDUSTRY HELP AMERICA*

INSPECT REGULARLY!

Don't neglect your **WRIGHT HOISTS.** Make them last longer by regular and proper maintenance. Here are a few suggestions:

Put the grease gun to work! A **WRIGHT HOIST** needs thorough lubrication once a month. Keep the load chain well lubricated, too.

Don't overload your hoist. While **WRIGHTS** are famous for their ability to stand abuse, this is no time to abuse machinery. Overloading results in a stretched chain which cannot seat itself properly in sheave pockets, thus accelerating wear.

Watch the load hook. **WRIGHT** hooks, drop-forged from special steel, give visible warning of overloading by slowly opening. Don't continue to use hooks that have stretched.

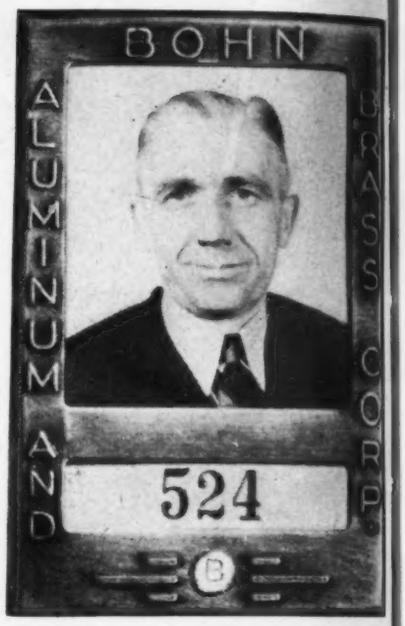
Inspect your hoists regularly. Remember: where properly maintained, **WRIGHT HOISTS** have given continuous, trouble-free service for 20 to 25 years.

In Business for Your Safety

WRIGHT MANUFACTURING DIVISION
York, Pa., Chicago, San Francisco, New York

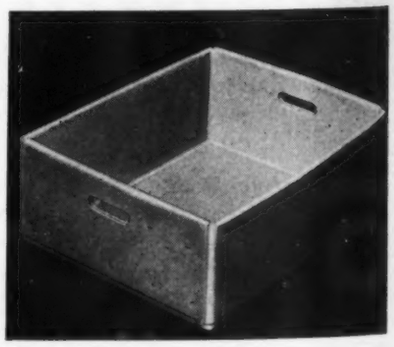
AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT, CONNECTICUT

continuous operation — eliminating the one, two, or three transfers from individual belts that were formerly necessary. The carcass of each steel-cable belt consists of parallel steel cables, each containing a multiplicity of closely laid thin strands. Goodyear Tire & Rubber Co.



TAMPERPROOF BADGES for employees. Photograph and employee number are permanently sealed, and badge can be opened for substitutions only with special press. Color strips identifying various departments quickly changed. American Emblem Co., Industrial Square, Utica, N. Y.

• VICTORY NEWS is a weekly pictorial display panel designed to keep up morale of war workers. Using current photographs of the war front and home front from OWI, Army, Navy, and Marines files, it attempts to show workers their vital part in the war effort. Subscription obtainable from Photo News Display Corp., 15 E. 40th St., New York.



METAL BEING SCARCE a shopbox of heavy solid fiberboard has been designed by Container Corp. of America, 111 W. Washington St., Chicago. Has nesting feature which permits stacking in tiers to save floor and bench space

See-ability in our war factories is now improved through better fluorescent lamps. Westinghouse Mazda fluorescent lamps are brighter from end to end, longer lasting, lower in cost, than ever before.

Westinghouse

★ MAZDA LAMPS ★

FOR GREATER SEE-ABILITY

The Strength of
STEEL
The Bearing Qualities of
BRONZE

This combination of a high grade bronze alloy with strip steel provides a new and unusual bearing material. In sleeve type bearings it enables you to increase speeds and loads . . . to gain longer bearing life and smoother operation . . . plus greater resistance to shock and to wear.

While Pre-Cast Bearing BRONZE ON STEEL was developed primarily for sleeve bearings, it also serves many other important industrial applications. For instance, it provides an ideal metal for stampings, washers or other flat pieces. For this type of service it is available . . . either plain or graphited . . . in rolls up to 400 feet in length . . . or as finished parts made to your specifications.

Why not investigate the possibilities of using this new bearing material in your product? A request, on your business letterhead, will bring you complete information—Free.

JOHNSON BRONZE
Sleeve Bearing Headquarters
512 S. MILL ST., NEW CASTLE, PA.

Specify JOHNSON BRONZE

WHAT'S NEW IN EQUIPMENT

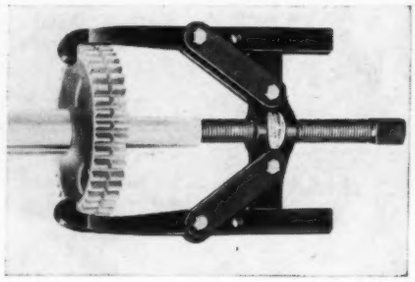
Humidifier

For use on steam-heating systems which carry less than 20-lb. pressure, E-Humidifiers are installed on the feed-end of radiators, or on steam-risers at points

where the condensate will return to the boiler when the radiators are turned off. Compact unit, entirely automatic in operation, diffuses moisture into the air. Capacity 30 gallons. Techtmann Industries, Inc., 828 N. Broadway, Milwaukee, Wisconsin.

Gear and Wheel Pullers

Rigid-arm pullers, called Steelgrip, are made in three sizes for pulling gears,



wheels, and pulleys up to 6, 8, and 12 inches in diameter. All parts are of heat-treated steel. Forcing screw thread is fine. Long arms are available for some models. Armstrong-Bray and Co., 5364–78 Northwest Highway, Chicago.

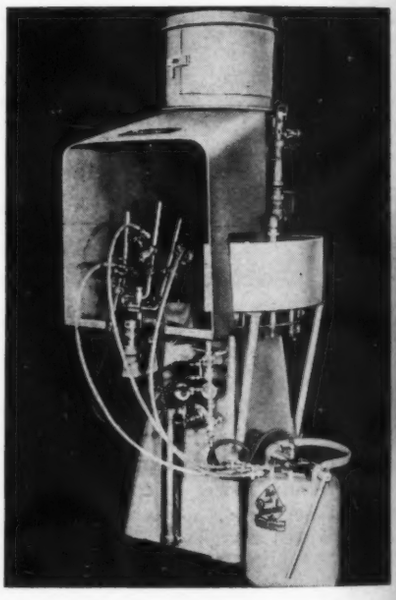
Hot-Cathode Fluorescent Light

The hot-cathode fluorescent lighting system, known as Artkraft, is said to embody constant-temperature hot cathodes that light at 40 degrees below zero. Lamp-rated at 5000 to 6000 hours and guaranteed for 3000 hours. Resonant starting eliminates the need for starter switches, and a constant voltage power pack permits operation at 85 to 135 volts. System is adaptable to 220 and 440 volts and cannot short-circuit the line. It is claimed that this product delivers more light for the same current, reduces flickering effect, and possesses a 100 percent power factor at rated voltage.

Easy-mount luminaire allows removal without tools, for cleaning the non-ferrous reflector on the lamp. Artkraft Sign Co., Lima, Ohio.

Aircoating Unit for Colloidal Graphite

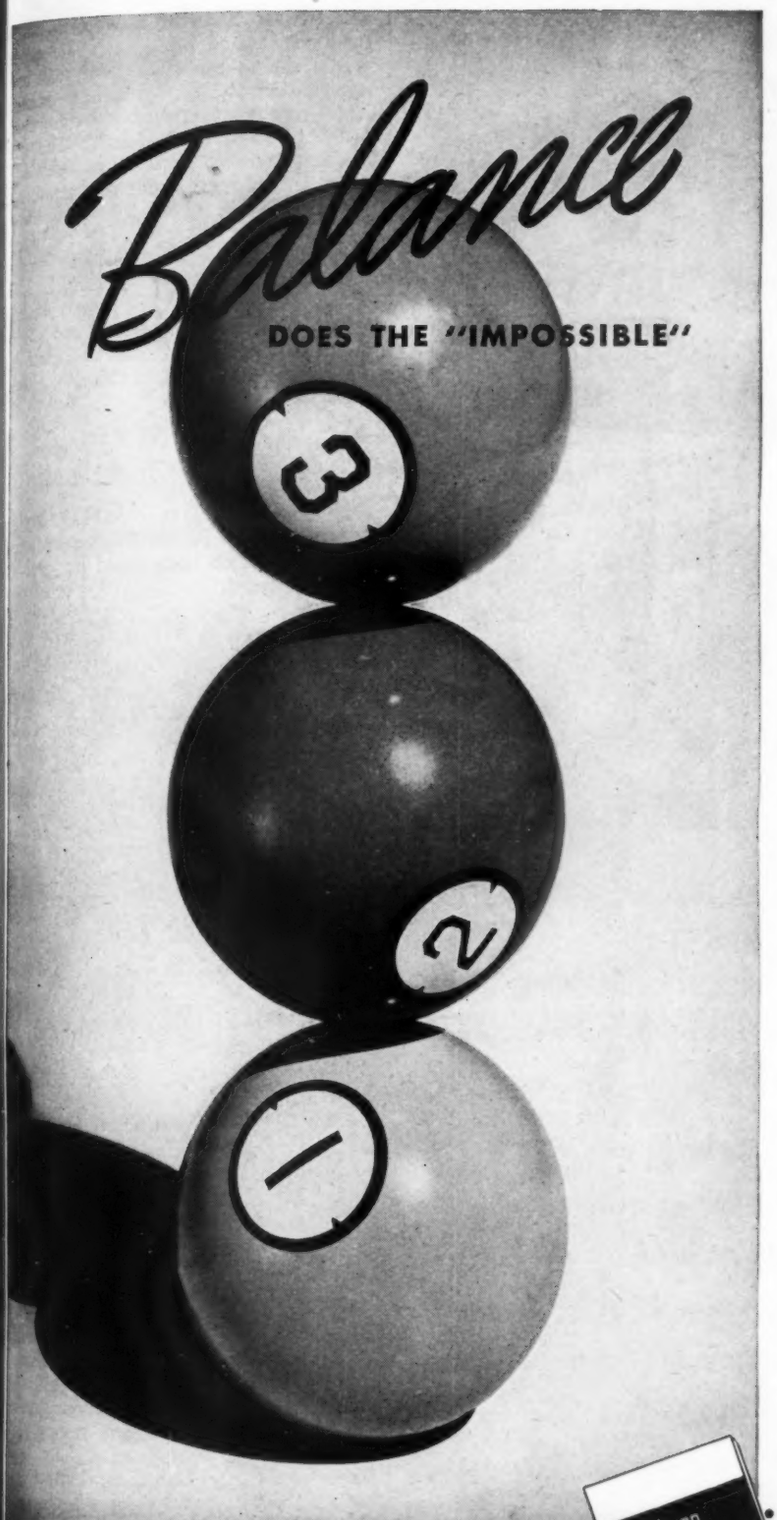
An automatic aircoating unit with pre-heating oven applies colloidal graphite compounds to metal parts. The unit



consists of a pressure-feed tank, necessary hose and fittings, automatic airbrushes mounted on a radial type oscillator, and a turntable aircoating unit with exhaust hood and gas-fired oven. Graphite materials dry hard, yet are soft enough for good lubrication. Paasche Airbrush Co., 190 Diversey Parkway, Chicago.

Grinding and Buffing Machine

Combination grinding and buffing machine has exhauster equipment for removing and collecting grinding and buffing particles. The left side has a safety hinge door wheel guard, adjustable to



AMERICAN ENGINEERING COMPANY

The Lo-Hed Hoist Is Applicable To Any Monorail System
There's A Balanced Lo-Hed Electric Hoist For Every Purpose

•

OTHER A-E-CO *PRODUCTS:* TAYLOR STOKERS, MARINE DECK AUXILIARIES, HELE-SHAW FLUID POWER

•

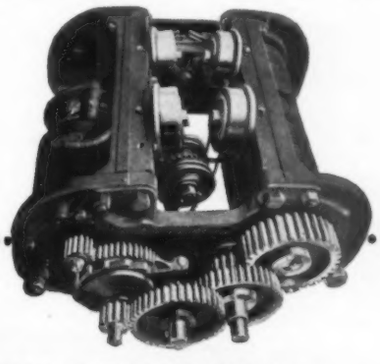
Look in your Classified Telephone Directory under "A-E-CO LO-HED HOISTS" for your nearest representative

BALANCE did the "impossible" in this electric hoist

Until the invention of the Lo-hed electric hoist, drawing the hook block up close to the beam was considered impossible. See how the Lo-Hed hoist overcomes this problem. Motor and drum are on opposite sides of the supporting beam. This balanced arrangement allows the hook to be pulled up between motor and drum—until it almost touches the beam, giving you minimum headroom—a desirable plus feature for which you pay no premium. This same arrangement makes possible the use of an all spur gear drive from motor to drum.

Besides these benefits the Lo-Hed hoist has every desirable feature you want in an electric hoist . . . heavy duty hoist motor, ball or roller bearings, automatic holding brake, 100% positive automatic stop when load reaches its upper limit, gearing sealed in an oil bath, a controller proof against fire, dust and moisture, easily removable covers and many others.

The Lo-Hed hoist is built to stand up three shifts a day, 7 days a week—the kind of a hoist you need now. The Lo-Hed you buy today will be going strong long after the war has ended . . . and you want that kind of a hoist too. Send for our catalog today.



AMERICAN ENGINEERING COMPANY
2426 Aramingo Avenue, Philadelphia, Penna.

☐ Please send me your complete catalog of LO-HED HOISTS
☐ Ask your representative to get in touch with me promptly

Name_____

Company_____

Street Address_____

City_____ State_____
(Please Print Plainly)

Calling all "hands" to faster production

"YANKEE" VISES
Four Handy Sizes with Swivel Base. V-block holds round stock securely.

In the hands of skilled workmen, "Yankee" Fine Mechanics' Tools meet and match the need for speed in this year of America's supreme effort. In their very design, these tools are streamlined for action. They get things done and done right.

On the production lines of a nation at war, they are "Yankee" clippers of vital minutes in the battle of production. "Yankee" Tools have had a half century's service in the shops of America. They were ready for their big test when war came. And when war ends, there will be enough of these fine mechanics' tools for all. In the meantime, furnish priority ratings whenever possible. Order from your supply house or write to us . . . c/o Dept. FMM-2.

"YANKEE" TOOLS
make good mechanics better
North Bros. Mfg. Co., Phila., Pa., U. S. A.
Established 1880

wheel wear and fitted with adjustable spark-breaker and work-rest. The spindle is mounted in three heavy-duty ball bearings and the buffer end is fully inclosed. Tool tray and removable waterpot are fitted to front of pedestal. The dust arrester assembly includes materials handling fan, blower, air-filtering stand, and adjustable exhaust hood for buffing wheel. The machine motor and fan motor operate through pushbutton starting equipment. Sizes available are 1, 2, 3 and 5 horsepower. The dust collecting system is available separately and is produced in three sizes. Standard Electric Tool Co., Dept. G, 2488 River Rd., Cincinnati.

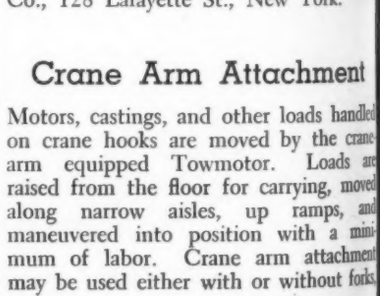
Tool Chest

Oak toolmakers chest, No. 1120, 20x9½ 16¾ inches, has eleven drawers including one drill drawer that may be used to

hold a drill block or a machinists' hand book. Chest is constructed of seasoned solid oak with a lacquer finish, heavy hardware, a leather handle, and two locks. Drawers are all felt lined. George Scherr Co., 128 Lafayette St., New York.

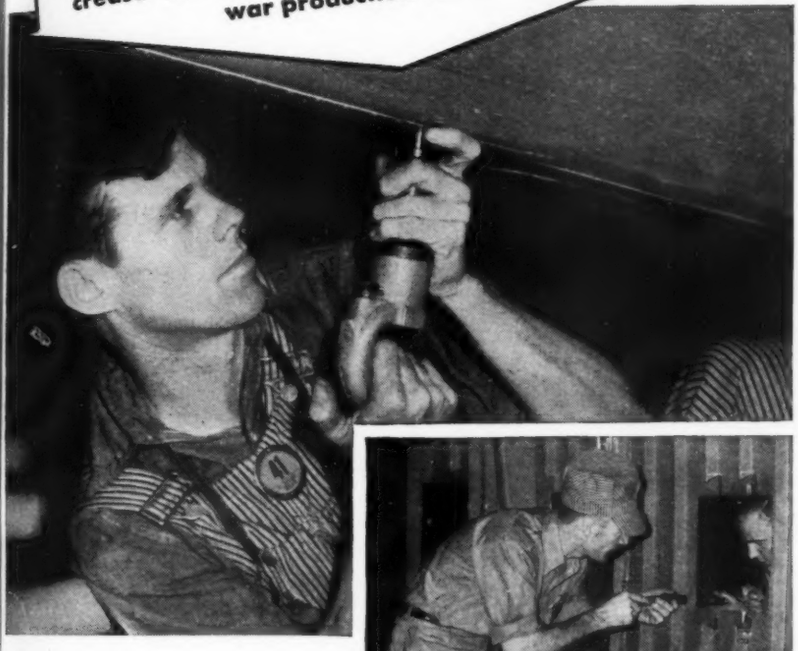
Crane Arm Attachment

Motors, castings, and other loads handled on crane hooks are moved by the crane arm equipped Towmotor. Loads are raised from the floor for carrying, moved along narrow aisles, up ramps, and maneuvered into position with a minimum of labor. Crane arm attachment may be used either with or without forks.



WHO SAYS FLOORS MUST ALWAYS BE DARK?

Pictures show two reasons why floors should be light in color—how white cement floors greatly increase the amount of useful light, thus speeding war production schedules.



Tests at Consolidated Aircraft Corporation, Fort Worth, prove that the white cement floor compared to the gray cement floor in this plant reflects 61% more light to the under side of wings and fuselage (*upper picture*) and 20% more light to vertical work surfaces (*lower picture*).

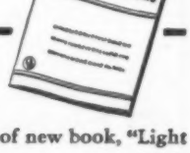
MOST floors are dark. That's because a floor has been thought of only as a space to walk, work or put things on. But today *dark* floors are being recognized as giant blotters or robbers of light, and *light-colored* floors as giant reflectors or conservers of light—reflectors that greatly increase the amount of comfortable, useful, productive light throughout the working area.

General Electric Lighting Engineers tested the efficiency of light-reflecting floors at Consolidated Aircraft Corporation, Fort Worth. Their tests show that this floor reflects 61% more light to under-side working areas and 20% more light to vertical work surfaces than did the gray cement floor in the same plant.

Write for LIGHT FROM FLOORS—a new 24-page book containing lighting data, advantages of white cement floors, and construction and maintenance information of real value to contractors, architects, engineers and owners. Mail the handy coupon today. Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York City.

* * *

OFFICES: *New York, Chicago, Philadelphia, Boston, Albany, Pittsburgh, Cleveland, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.*



ATLAS WHITE CEMENT

FOR LIGHT-REFLECTING FLOORS

Universal Atlas
Cement Company
Chrysler Building,
New York, N. Y.

Please send me copy of new book, "Light from Floors." F-F-9

Name_____

Position_____

Company_____

Address_____

SLY DUST CONTROL

HELPS MAINTAIN QUALITY AND QUANTITY

Sly Dust Filter exhausting blast room in large foundry.

THROUGHOUT industry Sly Dust Control is aiding both quality and quantity of production. It means cleaner plants, with better working conditions* for employees—a safeguard for health—an incentive for good and *continuous* work.

This system offers certain *exclusive* features because of the advantages of Sly Dust Filters (the heart of the system):

1. Greater filtering capacity because of more filtering cloth
2. Taut bags (patented) save power and improve dust removal
3. Bags more easily replaced
4. Automatic control (any degree) minimizes or entirely removes the human factor
5. Simpler shaker mechanism results in savings in maintenance and operation.

With all of its advantages, Sly Dust Control is *not* expensive. Ask for Bulletin 98 and state your problem so that we may write you fully.

* *Good working conditions cut down absenteeism.*

THE W. W. SLY MANUFACTURING CO.

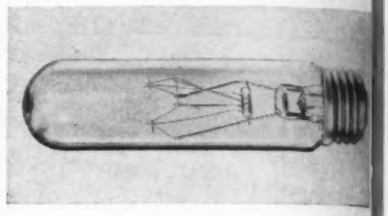
4755 Train Ave. **Cleveland, Ohio**

SLY
INDUSTRIAL DUST CONTROL

and is quickly demountable and interchangeable with standard forks so that the Towmotor on which it is used can be diverted to special handling assignments in a few minutes. Towmotor Co., 1226 East 152nd St., Cleveland.

Spatterproof Lamp

A lamp, known as the Radiant Spatterproof lamp, for welding and rough industrial service is made of a special glass



that resists penetration of hot metal particles. Built to withstand severe handling. Lamps have a T10 bulb with medium screw base. Sizes include 50, 75, 100, and 150 watts. Radiant Lamp Corp., 260 Sherman Ave., Newark, N. J.

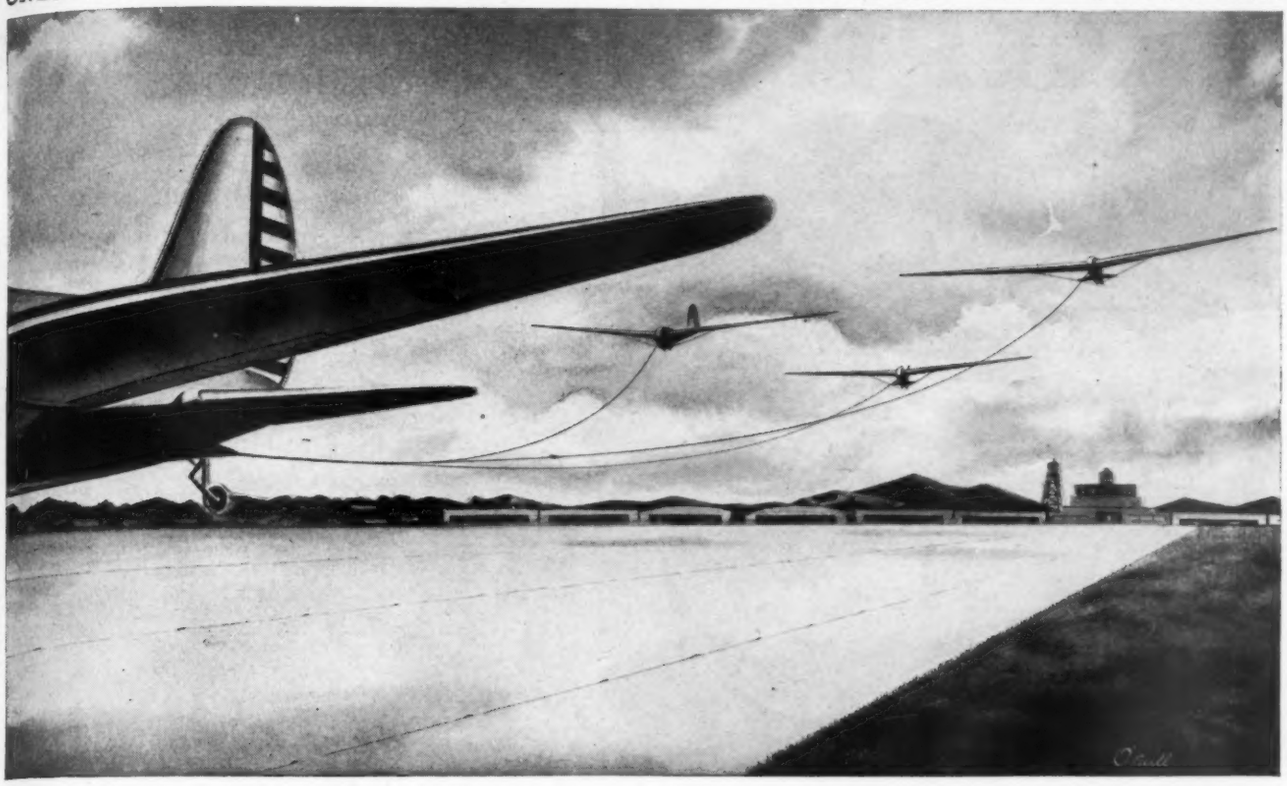
Quick-Acting Relay

Mercury relays, series BF, open and close the circuit in hermetically sealed hydrogen chambers. It is claimed that these relays are explosionproof. Energizing the coil moves a plunger downward; this motion causes the mercury to rise until contact is made with the electrode. Relays are available in 10-, 30-, and 75-amp. sizes. Time-delay feature on either opening, closing, or both can be provided. Solenoids for any voltage and frequency. Durakool, Inc., 1010 N. Main St., Elkhart, Ind.

Unit Heater and Ventilator

A combined unit heater and ventilator, known as Vertivent, has dampers that control the ratio of fresh to recirculated air. Control range is 100 percent fresh to 100 percent recirculated. Aerodynamic propeller type fan is driven by totally inclosed motor. Manufacturer claims that heating coils will temper full capacity of outside air from 20 degrees below zero. Rigid angle iron frame is used

ONLY AN ELECTRICAL WHOLESALER COULD THUS SPEED WAR PRODUCTION



WESCO helped gliders fly 5 weeks earlier

Delivered Materials Complete in 19 Days; Huge Plant Met Government Deadline

In the granary of America a glider plant was ordered built; time limit for completion 30 days. On the 20th of the month the nearest Wesco House received the large order for panelboards, transformers, fluorescent lighting, power cable and potheads. The job was awarded because of Wesco's reputation for fast delivery and follow-through service.

Wesco placed all orders the same day and suppliers the country over sprang into action. In less than a week trucks rolled up and began unloading at the site. In 19 days every item ordered from Wesco was on the job as compared with 7 weeks best possible delivery from manufacturers. The plant was completed and in production on the 30th day.

This Wesco performance, and scores like it, don't just happen. They are the result of years of training, experience and individual ability. Wesco service has enlisted "for the duration". After Victory it will again speed the development of business.

WESCO SPEEDS PRODUCTION

* A Marine air base needed delivery of hundreds of electrical items next morning. Five Wesco Houses pooled stocks and met the deadline.
* Lack of a critical product threatened to tie-up a war chemical plant. The manufacturer promised delivery in 60 days. Wesco delivered in 24 hrs.!

WESCO SERVES BUSINESS

* By warehousing stocks in anticipation of customers' needs.
* By providing engineering service in making up lists of materials and in preparing bids on jobs.
* By buying large quantities at low prices and passing the savings on to small-quantity buyers.

Westinghouse Electric Supply Co.

150 VARICK STREET • • • NEW YORK, N.Y.

A NATIONAL DISTRIBUTING ORGANIZATION WITH 80 BRANCHES

EXCEPTIONAL!

How DEVOPAKE hides and covers any surface *in just one coat*

Alert, production-minded maintenance men realize the necessity of improving *seeing conditions* and preserving interior wall surfaces in first class condition. They have welcomed Devopake with cheers. Here's a painter's paint that not only covers more surface per gallon, but which really hides solidly — in just one coat — over any type of interior wall surface. Applied with brush or spray it goes on evenly, easily and quickly. *Self-sealing primer and finish coat in one* saves time on the job with minimum interruptions of essential activities. It's so tough it stands up under the hardest kind of wear — and repeated wash-downs.

In response to a popular demand Devopake is now available in seven practical colors.

Specify Devopake on your next paint job. You'll save time and money — we guarantee you'll be completely satisfied.

Devoe's maintenance paint line is built to meet all your requirements including high resistance to moisture, oxidation, fungi or fumes. Write us today for complete information that can help you solve your maintenance paint problems.

DEVOE & RAYNOLDS CO., INC.

The 189th Year of the Oldest Paint Maker in America

FIRST AVENUE AT 44TH STREET, NEW YORK, N. Y.

with either steel or non-metallic housing. Intake section is hinged for access and provided with protective screen. Two types of diffuser outlets are available. Young Radiator Co., Racine, Wis.

Gypsum Siding

A gypsum board, called Triple-Sealed Sheet-Rock Siding, builds, sheathes, sides, braces, and decorates, in one operation. Made of gypsum, the board is fireproof and weatherproof, it is claimed. A drip-cap shiplag edge protects joints between boards from the weather. Board has a camouflage-green exterior surface for exposure to the weather, and a manila inner surface that makes an interior finish without decoration. The board is made one inch thick, 2 feet wide, and 6, 8, 9, and 10 feet long. It is designed to be used on standard construction. Made of non-critical materials. United States Gypsum Co., 300 W. Adams St., Chicago.

Drum Lift Carrier

Carrier, designated as 14-in. Lift Model, handles 55-gal. containers. Lifting device raises drum or barrel 14 inches from floor by pulling down the handle, which automatically locks. The container may then

be lowered by releasing the lock and applying the brake. The operator does not touch the container. Carrier has three wheels and a capacity of 700 pounds. Ernst Carrier Sales Co., 1456 Jefferson Ave., Buffalo, N. Y.

Portable Coolant Pumps

Two portable coolant pumps are adaptable to almost any machine tool. Pumping capacities meet maximum-flow requirements of most makes of lathes, drill presses, millers, grinders, cutoff saws, screw machines, and single and multiple spindle drilling and tapping machines. Centrifugal design of the coolant pumps increases rigidity, lengthens service life, and insures

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Your local RCA Tube and Equipment Distributor is headquarters for the following items, and, equally important, for the all-essential "know how" of their application and use:
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. . . also condensers, resistors, rheostats, controls, potentiometers, coils, wire, and numerous other radio and electronic components produced by many manufacturers.
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Put his services to work in solving your electronic equipment buying problems. Take advantage of the large and varied stocks he normally maintains. Let him serve as your specialized "expediter." Ask him for the technical suggestions he is so well qualified to give!

RCA MANUFACTURING CO., INC., Camden, N.J.

AN ADVERTISEMENT OF THE RCA TUBE AND EQUIPMENT DIVISION IN THE INTEREST OF GREATER SERVICE AND EFFICIENCY IN PRIORITY-COVERED WAR MATERIALS BUYING

BUILT LIKE A BATTLESHIP--

for heavy-duty service on war-time jobs

Model 30.11A

HEIN-WERNER HYDRAULIC JACK

incorporates an entirely new arrangement of dual operated two speed pumps

The tandem arrangement for dual operation of two speed pumps is a *great* feature, and is an important factor in making Model 30.11A unusually fast and easy operating.

In the initial operation, the jack handle is extended through the handle sockets of both the *high speed pump* and the *high pressure pump*, thus giving the combined displacement of both pumps to attain *maximum speed*. If and when the pumping becomes an effort for the operator, he simply pulls the handle back out of the handle socket of the high speed pump, (thus disengaging the high speed pump)—and he finishes lifting the load by utilizing only the high pressure pump which operates at slower speed and minimum effort.

Other features include BASE MADE of SOLID STEEL BAR 1½" thick . . . Two Release Screws or Valves, either of which controls the return of the ram . . . Easy-to-carry handle . . . For full details on Model 30.11A (illustrated), as well as on 3, 5, 8, 12 and 20 ton models, consult your industrial supply distributor, or write us.

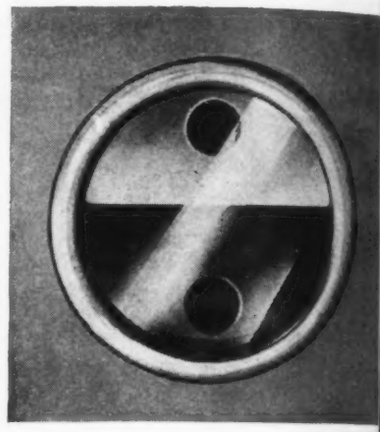
HEIN-WERNER MOTOR PARTS CORP.
Waukesha, Wisconsin

HEIN-WERNER HYDRAULIC JACKS
Are Built Right and Priced Right

smooth performance, it is claimed. No priming is necessary. Complete coolant systems may be assembled by selecting feed and return units. Atlas Press Co., Dept. 7, 1941 Nancarrow St., Kalamazoo.

Oil Window Unit

Oil window unit consists of a window of clear plastic assembled in a polished metal housing. Oilproof synthetic gasket insures oil-tightness between window and



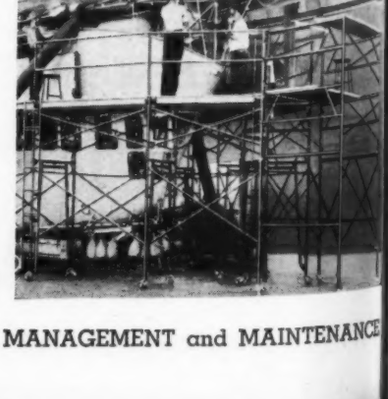
frame. The bright background of the housing provides sharp visibility of oil level. Two holes in the metallic background give easy passage to the oil. Unit is available in sizes to give clear window diameters of ⅝, 1, and 1¼ inches. Bijur Lubricating Corp., Long Island City, N. Y.

Explosionproof Fluorescent Unit

Explosionproof fluorescent unit complies with the requirements for Class I, Group D and Class II, Group G hazardous locations. Construction eliminates sealing fittings and accessories. Terminal block provides for line connections. Lamps, starters, and ballasts are accessible. Reflector is non-metallic with baked white finish. Appleton Electric Co., 1701-29 Wellington Ave., Chicago.

Steel Scaffolding

Steel scaffolding is light in weight, rigid, and strong. It occupies minimum space when erected or dismantled and stored. All parts are interchangeable and may be used repeatedly in a numberless variety of forms and shapes. Line includes lad-



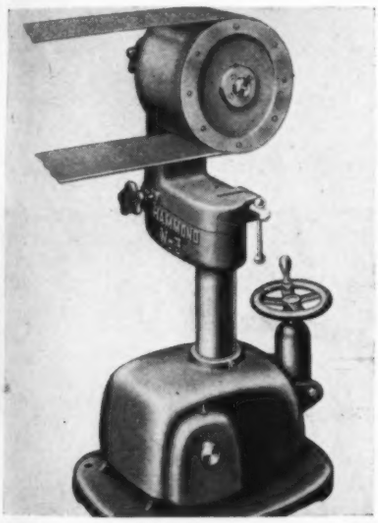
ders, hoists, ramps, rolling towers, and materials handling towers. Basic unit consists of two end frames which, when erected, are held rigidly together by two cross braces; complete unit is 5 feet wide, 7 feet long, and 5 feet high. Desired heights and lengths are obtained by adding similar units to the basic unit through the use of coupling pins and braces. Safway Steel Products, Inc., 6228 W. State St., Milwaukee.

Drum Plug Wrench

Wrench removes and tightens plugs or bungs in steel drums. Tool is manufactured of steel alloy with long iron pipe handle; also available in "S monel" metal which has low sparking qualities. Fits all sizes of plugs and bungs. Industrial Products Co., 2820 N. Fourth St., Philadelphia.

Abrasive Belt Backstand Idler

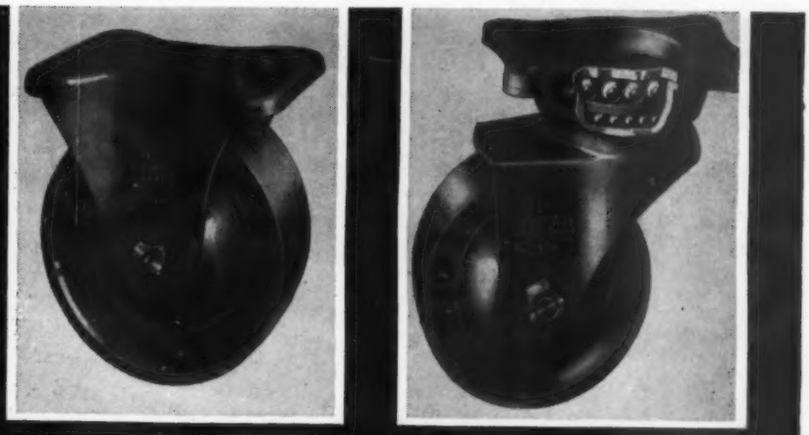
Backstand idler, designated as Model No. 3, is for use in conjunction with abrasive belts. Spring-loaded adjusting screw and handwheel maintain uniform tension on the belts and release tension to make belt changes. Unit is a heavy-duty type with ball-bearing pulleys and simple adjust-



ment for belt positioning and tracking. Machine can be used in either right or left hand position by turning the idler wheel head and column 180 degrees and locking in position. Hammond Machinery Builders, Inc., 1637 Douglas Ave., Kalamazoo, Mich.

Photo-Electric Controls

Photo-electric controls, Type A15, are rated at 10 amperes a.c. at 115 volts. The output terminals are those of a single-pole double-throw switch and provide for action either when the light beam is broken or when it is made. The operating distance varies with the light source. Type A15 control provides operation for industrial applications such as



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Precision-made Darnell Casters with the DOUBLE BALL-BEARING SWIVEL assure a long life of efficient, economical service

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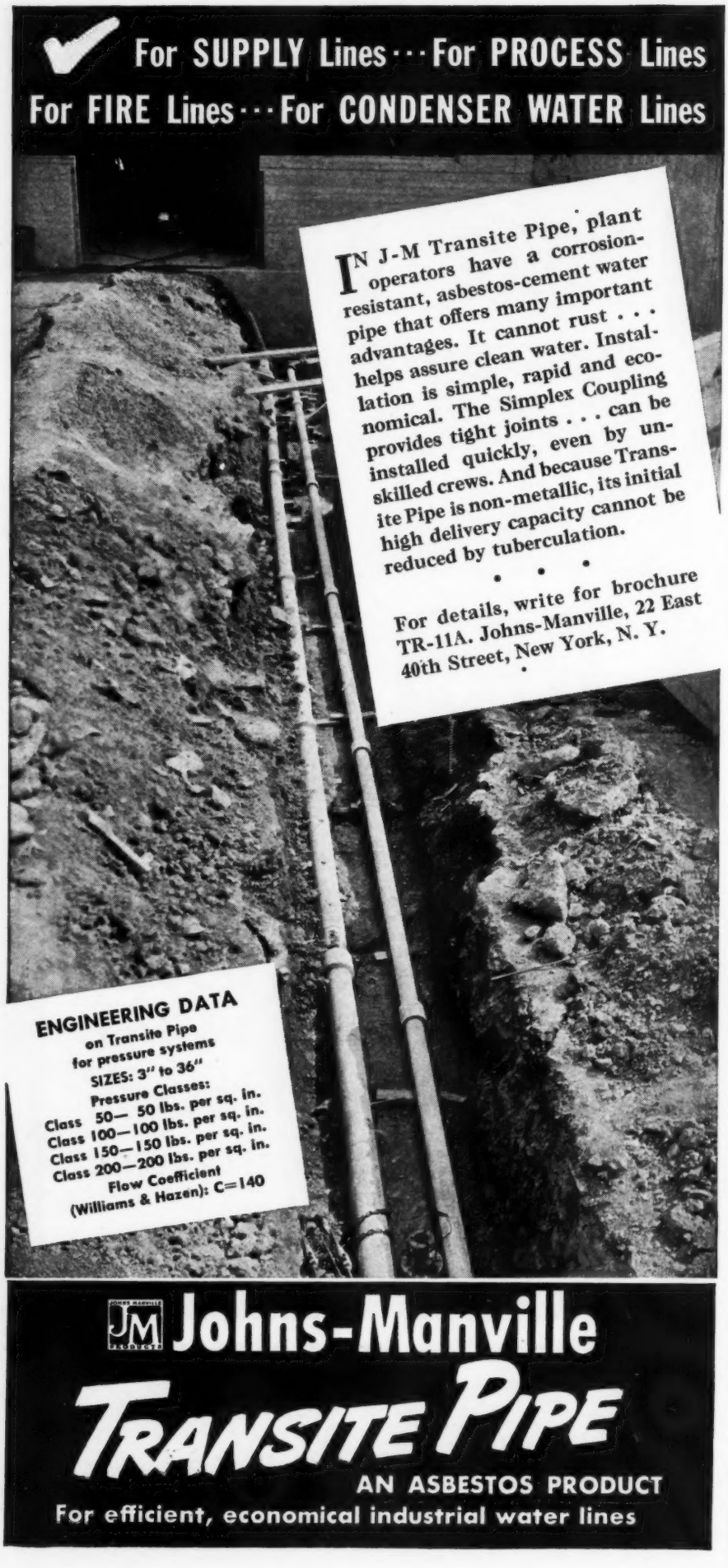
For SUPPLY Lines · · · For PROCESS Lines
For FIRE Lines · · · For CONDENSER WATER Lines
IN J-M Transite Pipe, plant operators have a corrosion-resistant, asbestos-cement water pipe that offers many important advantages. It cannot rust . . . helps assure clean water. Installation is simple, rapid and economical. The Simplex Coupling provides tight joints . . . can be installed quickly, even by unskilled crews. And because Transite Pipe is non-metallic, its initial high delivery capacity cannot be reduced by tuberculation.
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for pressure systems
SIZES: 3" to 36"
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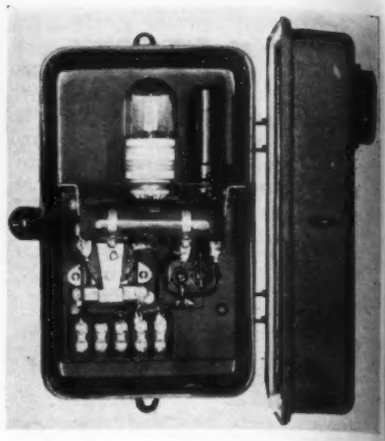


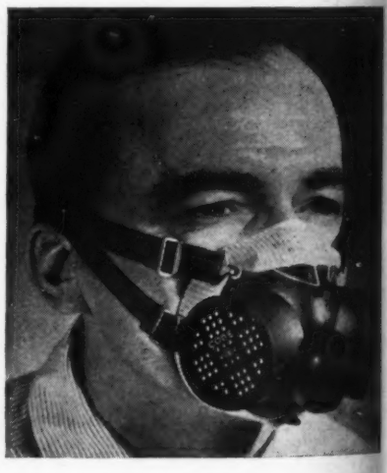
counting, conveyor control, machinery safeguards, signal and alarm systems, motor or valve control, inspection, and break detection. Photoswitch, Inc., 1[illegible] Chestnut St., Cambridge, Mass.

Magnifying Scale

A tool, known as the Micro-Scale, consists of a standard machinist's scale divided into 64ths of an inch, and a magnifying attachment. Magnifier is a plastic lens mounted on a slide block. Used to check the length of parts, depth of holes, center distances in layouts, and finishes of metal. Leonard Engineering Co., Silver Spring, Md.

Cartridge Respirator

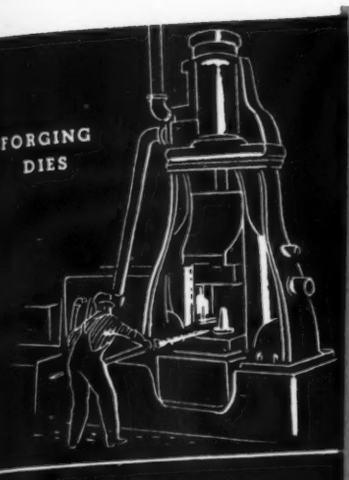
Colored plastic chemical cartridges make this respirator useful in a wide variety of sprays, fumes, and smokes. The color



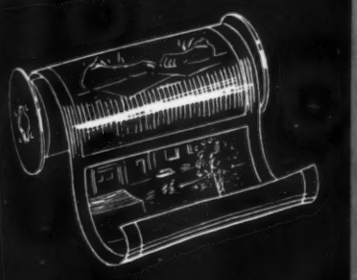
of the cartridge indicates the content of the cartridge and the uses to which it may be put. Face piece is of molded rubber, and cartridges are readily changeable. H. S. Cover, South Bend, Ind.

Portable Floodlights

Large floodlight, 1610 Series Circulite, may be placed anywhere, on floor, on truck, or other vehicle. Models supplied with casters are useful in assembly and repair shops. Uses 300- to 500-watt lamp,



FORGING DIES



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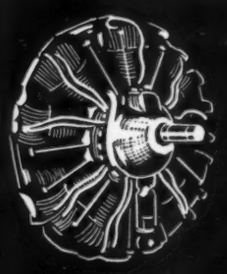


AIRPLANE ENGINE

CATHODE RAY TUBE

"dag" COLLOIDAL GRAPHITE

IS IMPORTANT in the Manufacture or Use of these Products

HERE ARE THE RULES

Acheson Colloids Corporation will give a $25.00 War Bond to each of the 5 people who submit complete and accurate answers together with the 5 best letters on the question, "Why is **"dag"** colloidal graphite important in the manufacture and/or use of the products pictured here?" (1) State business connections (no one in the graphite field or their families will be eligible). (2) All entries must be legible. (3) All entries must state the publication in which the advertisement was seen. (4) Entries must be postmarked not later than April 15, 1943. (5) In case of ties, duplicate awards will be made. (6) Entries become the property of the Acheson Colloids Corp. (7) The verdict of the judges will be final.

"dag" COLLOIDAL GRAPHITE FOR TREATING SCREW THREADS

Screws and bolts which have long been in place are often extremely difficult to remove, especially if the assembly of which they are a part has been exposed to heat, moisture, or the action of certain corrosive chemicals. In many cases they cannot be removed without being destroyed.

Typical examples of this are bolts, studs and nuts on engine manifolds and turbines, pipe, spark plugs, set screws used in large clothes pressing irons, etc. Likewise, electric lamp bulbs, subject to salt spray or chemical fumes, stick in their sockets so tightly they cannot be removed without breaking.

The time and effort used in removing frozen screws can be saved by treating the threads before assembly with "dag" colloidal graphite. This material provides the necessary lubrication to reduce static friction between screw threads and to permit the removal of the screw with a minimum of effort. "dag" colloidal graphite is a lubricant which is not destroyed by the action of heat and which in some cases exhibits anti-corrosive properties.

Screws and bolts treated with "dag" colloidal graphite may be drawn up tighter and with less effort than they could be otherwise. Such treatment is the only practical way of keeping anodized aluminum screw threads easily workable.

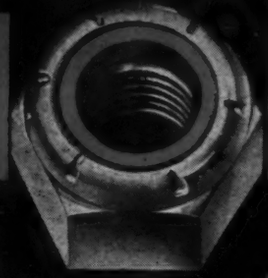
Write for NEW BULLETIN 430HH on "dag" Colloidal Graphite—Its Importance to Modern Industry

ACHESON COLLOIDS CORPORATION

PORT HURON • MICHIGAN

dag COLLOIDAL PRODUCTS

WE'VE MADE BILLIONS



—and not one has loosened

THEY'RE on oil well pumps—some for twelve years.

They're standard equipment on rock drills — industry's toughest fastening problem.

They're on tanks, planes, guns—all kinds of wartime material—all kinds of peacetime equipment.

All told, billions of Elastic Stop Nuts have gone to work.

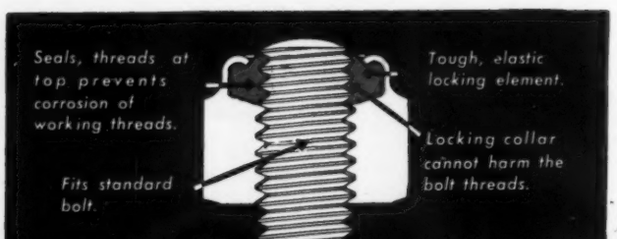
And as far as we know, not one has failed to do its job.

That job is to hold fast and stay put—come what may in the way of vibration, jar or chatter.

Of course the need for such dependable fastenings in war goods and planes is paramount. Some planes take as many as 35,000 in a single ship.

So even at our 4,000,000-a-day rate (which soon will double) the demand keeps growing.

But this constant call for more and more—to meet the exacting responsibilities of war—gives ample proof that Elastic Stop Nuts answer every need for secure locking and speedy fabrication.


Seals, threads at top prevents corrosion of working threads.
Fits standard bolt.
Tough, elastic locking element.
Locking collar cannot harm the bolt threads.

Write for folder explaining the Elastic Stop self-locking principle.

ELASTIC STOP NUT

CORPORATION OF AMERICA

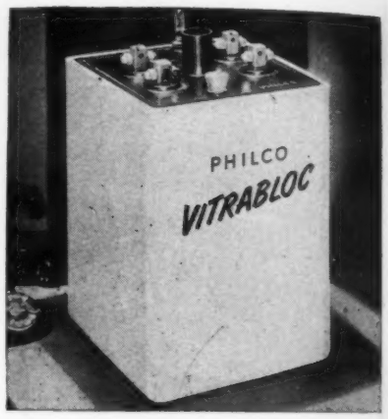
2330 Vauxhall Road, Union, N. J.

WITH THE RED COLLAR — SYMBOL OF SECURITY

is adjustable to any angle, vertical or horizontal, has a 12-in. chromium-plated reflector, and is supplied with 20 feet of cord. Steber Mfg. Co., 2451 N. Sacramento Ave., Chicago.

Ceramic Battery Jar

Ceramic battery jar, called Vitrabloc, is a blend of clays to obtain density, color, strength, and resistance to shrinkage. Inside and outside glazed surface is actually fused into the jar.



Jar does not absorb moisture, nor will acid penetrate or affect it. When heated to 212 degrees and then plunged into ice water, there is no contraction of the jar. Pure white in color, Vitrabloc jars give high light reflection to brighten dark battery rooms. Because of its glassy surface and spray-proof funnel vents, the jar can be kept clean with little attention. Is explosionproof and can be set up next to other electrical equipment. Philco Corp., Philadelphia.

Coolant Pumps

Coolant and circulating pumps include ¾ and 1-in. sidewall-mounted types, a 1¼-in. sidewall-mounted type for low-submergence applications, and a 1¼-in. horizontal type. These pumps are suitable for installation on machinery requiring a coolant or circulating unit; for example, those of lathes, drills, automatics,

A tip on turbine economy straight from the horse's mouth: "Don't use Elephant Power' steam turbines too big for the job when COPPUS 'horsepower' steam turbines can be obtained in 6 sizes from 150 H. P. to fractional. Each smaller frame saves metal for front-line fighters and money for you . And COPPUS Blue Ribbons mean quality you can count on in the home stretch"

COPPUS TURBINES

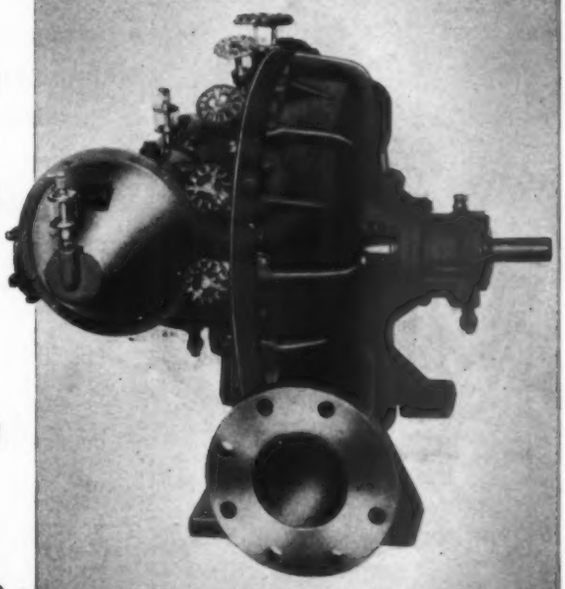
Save Metal in Wartime — Will Save You Money in Peacetime

Like all Coppus "Blue Ribbon" Products (blowers, ventilators, gas burners, etc.), the Coppus steam turbine is a precision-made product . . . controlled by Johansson size blocks . . . and every turbine is dynamometer-tested before shipment. More than 85% of all orders since 1937 have been repeat orders.

Write for Bulletin 135-9

COPPUS ENGINEERING CORPORATION
202 Park Avenue, Worcester, Mass.

Sales Offices in THOMAS' REGISTER
Other "Blue Ribbon" Products in SWEET'S



COPPUS

BLUE RIBBON PRODUCTS

DESIGNED FOR YOUR INDUSTRY
ENGINEERED FOR YOU

Every Minute Saved in Maintenance . . . Means More Productive Hours

And these husky "King-clip" valves are doing just that . . . saving those precious minutes that add up to more productive time. With "King-clips" on the job, maintenance is cut to a minimum . . . users are assured of a practically permanent installation, free from the hundred-and-one "valve headaches".

Fig. 1640
Iron Body
Bronze Mounted

Fig. 1644
All-Iron

"King-clip" Valves are doing their part in another respect, too . . . in conserving critical materials. Since only the working parts are made of bronze, these iron body valves use less copper, tin and other scarce materials than all-bronze valves, and they perform equally as well on many services.

And here's an important point . . . you are likely to get better deliveries on "King-clips" than on the scarcer all-bronze valves. The complete facilities of Lunkenheimer distributors are at your service. They'll go out to help you get the things you need.

●

Since virtually all materials used in the manufacture of valves are on the list of critical materials, valve users are urged to furnish the highest possible preference ratings and proper "end use" information on their orders. This will be of mutual helpfulness.

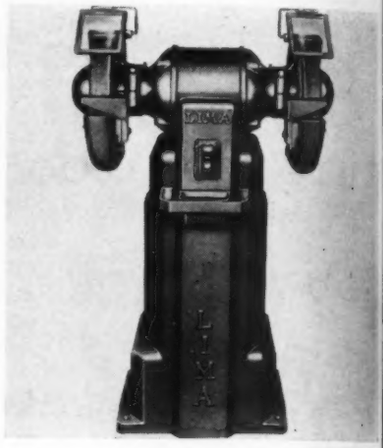
ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI, OHIO, U. S. A.
NEW YORK CHICAGO
BOSTON PHILADELPHIA
EXPORT DEPT. 318-322 HUDSON ST., NEW YORK

Bronze, Iron and Steel Valves, 125 to 2500 lb. S. P. for all Industries; Boiler Mountings, Lubricating Devices, Aircraft Fittings

cutoff machines, and grinders which require a constant supply of cooling fluid or cutting oil. Other equipment for which these pumps are suitable includes evaporative condensers, air conditioning units, washers, etc. Ingersoll-Rand Co., 11 Broadway, New York.

Pedestal Grinder

A grinder, known as the Lima Pedestal Grinder, is available in two sizes, 2 and 3 horsepower. Both models run at 1800



r.p.m. and are available with 2- or 3-phase totally inclosed motor. Dust-tight ball bearings, pushbutton control. Voltages 220, 400, or 550. The Lima Electric Motor Co., Lima, Ohio.

Plastic Spray Gun

Spray gun with black plastic body weighs a quarter of a pound less than the spray gun with aluminum body that it replaces. Lighter weight reduces fatigue, it is

claimed. The plastic has good chemical resistance and is not affected by thinners, solvents, and paint removers. Gun is strong and easy to clean. Eclipse Air Brush Co., 400 Park Ave., Newark, N. J.

Solenoid Starter

Solenoid motor starter, known as Thermaload V, has a bimetal compensated overload relay. The start button must be pressed and released before contact is

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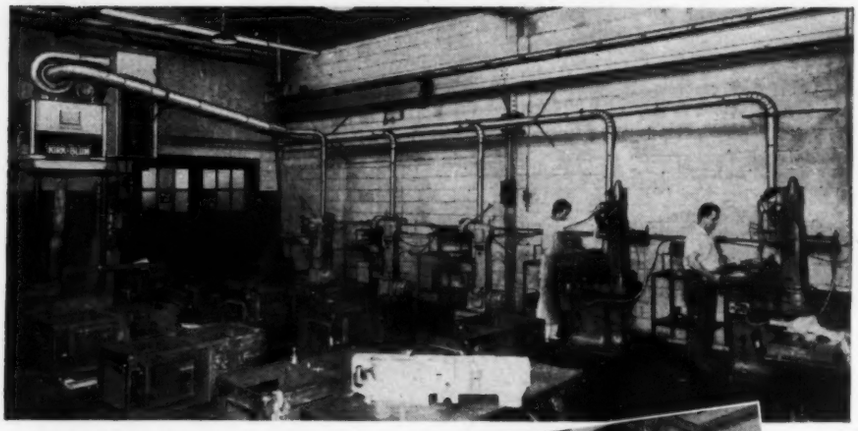
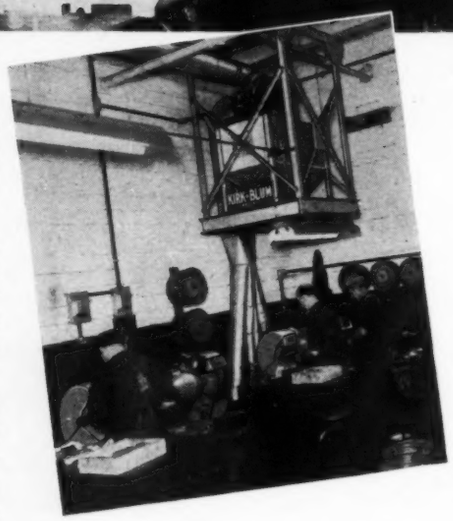
NAVY
for DISTINGUISHED SERVICE
"This award is your nation's tribute to your patriotism and to your great work in backing up our soldiers on the fighting fronts. I have full confidence that your present high achievement is indicative of what you will do in the future."
ROBERT P. PATTERSON
Under Secretary of War
THE ARO EQUIP. CORP.
ARO
BRYAN, OHIO
AIRCRAFT PRODUCTS
PNEUMATIC TOOLS
LUBRICATING EQUIPMENT
MINUTE MAN FLAG WITH "T" AWARDED JULY, 1942

Another

KIRK & BLUM
DUST CONTROL SYSTEM

meets unusual demands





Interior views show Kirk & Blum installation at The Sheffield Corp.

"We must have silence as well as efficiency in the operation of an exhaust system", The Sheffield Corp., Dayton, Ohio, manufacturers of various types of gauges, told us. "Our skilled craftsmen, operating small magnetic chuck-type grinders must hear the grinding wheel in contact with gauge block."

Here was an unusual demand and Kirk & Blum met it, using Roto-Clones manufactured by American Air Filter Co., Inc. We made individual installations for the grinders. The hoods especially designed for maximum flexibility and easy adjustment, reduced sound of operation to a minimum. The air handled by each system is returned to the building so it does not disturb the ideal heating and air-conditioning systems in operation.

A similar installation and a ventilating system were made in the heat-treating department. Here outside air, tempered in winter and cooled in summer, is introduced to normalize temperature. Fume exhausted from chrome tanks and cyanide pots is handled by separate systems to safeguard workers' health.

Consult Kirk & Blum regarding your dust control and ventilating problems.

Send for any of the following booklets:

"Dust Collecting Systems in Metal Industries"
"Blower Systems for Woodworking Plants"
"Fan Systems for Various Industries"
"Industrial Ovens"
"Cooling Systems for the Glass Industry"
"Data on Kirk & Blum Production Facilities"

THE KIRK & BLUM MANUFACTURING CO.
AN ORGANIZATION OF ENGINEERS AND MECHANICS
2835 SPRING GROVE AVE. CINCINNATI, OHIO

made. Features include shockproof mounting, double-break silver contacts, and interchangeable coils. Trip always occurs within the same time at a given percentage of overload, it is claimed. Can't be held in "on" position. Mounting reduces objectionable hum. All parts are accessible. Available in five sizes: 1.5 to 7.5 horsepower and 110 to 550 volts. Case measures 5¾x4¼x4¼ inches. This starter is approved by the Underwriters' Laboratories. Monitor Controller Co., 51 S. Gay St., Baltimore, Md.

Automatic Transfer Switch

Transfer switch automatically shifts circuit from one power source to another in case of voltage failure on the preferred source. When voltage is restored to the normal source, the circuit is returned to that source. Switches are supplied open or closed, front to back connected, with 2, 3, or 4 poles, and with ratings of 30 to 300 amperes. Circuit transfer occurs at 50 percent normal voltage. Available with 70 percent normal voltage transfer. Zenith Electric Co., 152 W. Walton St., Chicago.

Industrial Gloves for Women

Rubberized gloves for women workers supply hand protection against solvents, acids, chemicals, caustics, and other cor-

WANTED...

SUB-CONTRACTS FOR FABRICATED STRUCTURAL STEEL, SHEET METAL AND PLATE WORK

[EITHER WELDED OR RIVETED]

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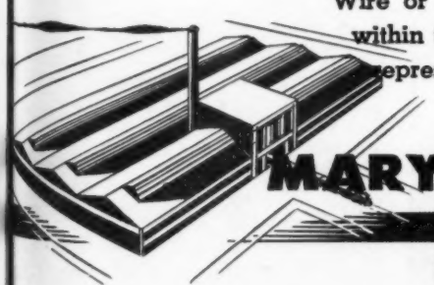
Plant layout blueprints and details of facilities are ready for immediate mailing . . . . . .

Since early 1940, the equipment and experience of the Maryland Metal Building Company has been devoted exclusively to war production. Practically any item fabricated from steel sheets, plates and structural shapes can be turned out quickly and economically in this plant that has, for twenty-two years, fabricated steel buildings for hundreds of industrial plants.

Riveted and welded structural steel, fuel and water tanks and their supports, mushroom ventilators, engine beds, pump pans, rudders, struts are a few of the war products that we have made. Many others are possible with our machines.

Our plant is strategically located—rail and water shipping facilities are in our "back yard." Can you make use of what we offer? Wire or write for blueprints and capacity data. It will be sent within the hour—or it will be delivered personally by a company representative if you wish.



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All it took was a trial installation of one Conveyor in the Assembly Department of an Ordnance plant, and production per day was stepped up 2½ times—with the same number of operators! So outstandingly successful was this trial unit that eleven other conveyors were installed. And to top it—*the savings effected by each Conveyor returns its purchase price every two months!*

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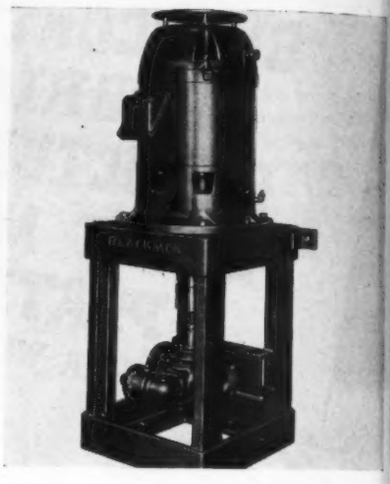
Makers of CONVEYORS and PNEUMATIC DISPATCH TUBES

SYRACUSE, N. Y.

rosive materials, it is claimed. These gloves are reinforced with a fabric lining that makes them snag- and tear-resistant. They are flexible, comfortable to wear, easy to pull off and on. Two sizes, medium and large—both gauntlet type. Edmont Mfg. Co., 560 Orange St., Coshocton, Ohio.

Vertical Rotary Pump

Rotary pump, vertically mounted and powered by a 15-hp. gearhead motor, is now being built for use in industrial plants requiring the transfer of oils and



other non-abrasive liquids. Capacity 100 g.p.m. at a pressure of 100 psi., handling diesel fuel. All-bronze pumping unit. Motor speed is 1770 r.p.m. reducing to 440 r.p.m. on the drive shaft. Base is fabricated steel, designed for bottom and back anchorage in mounting. Blackmer Pump Co., Grand Rapids, Mich.

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Furthermore, Formcraft engineering—an important part of Standard's service—eliminates useless forms, saves paper, combines related forms for *one* writing, simplifies form design for fast, accurate, legible handwriting.

Today, thousands of Standard Registers are serving America's war industries. To learn how and where you can use them—

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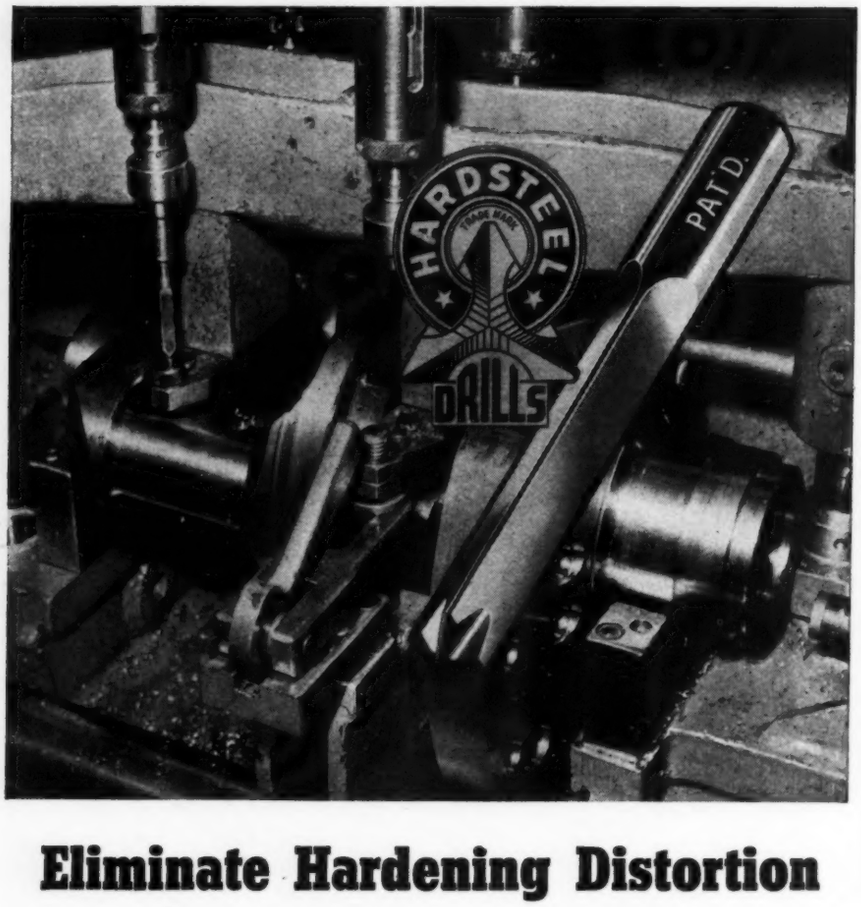

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YOU HARDEN IT—WE'LL DRILL IT

"HARDSTEEL"

DRILLS · REAMERS · TOOL BITS · SPECIAL TOOLS

Where Is Labor Headed?

(*Continued from page 81*)

former "targets" and encountered so sudden and surprising a shift to "fair and warmer" in the entire country's economic and psychological climate.

To be sure, considerable opportunity still exists for protecting the worker by means of the same old strategy of battling the employer.

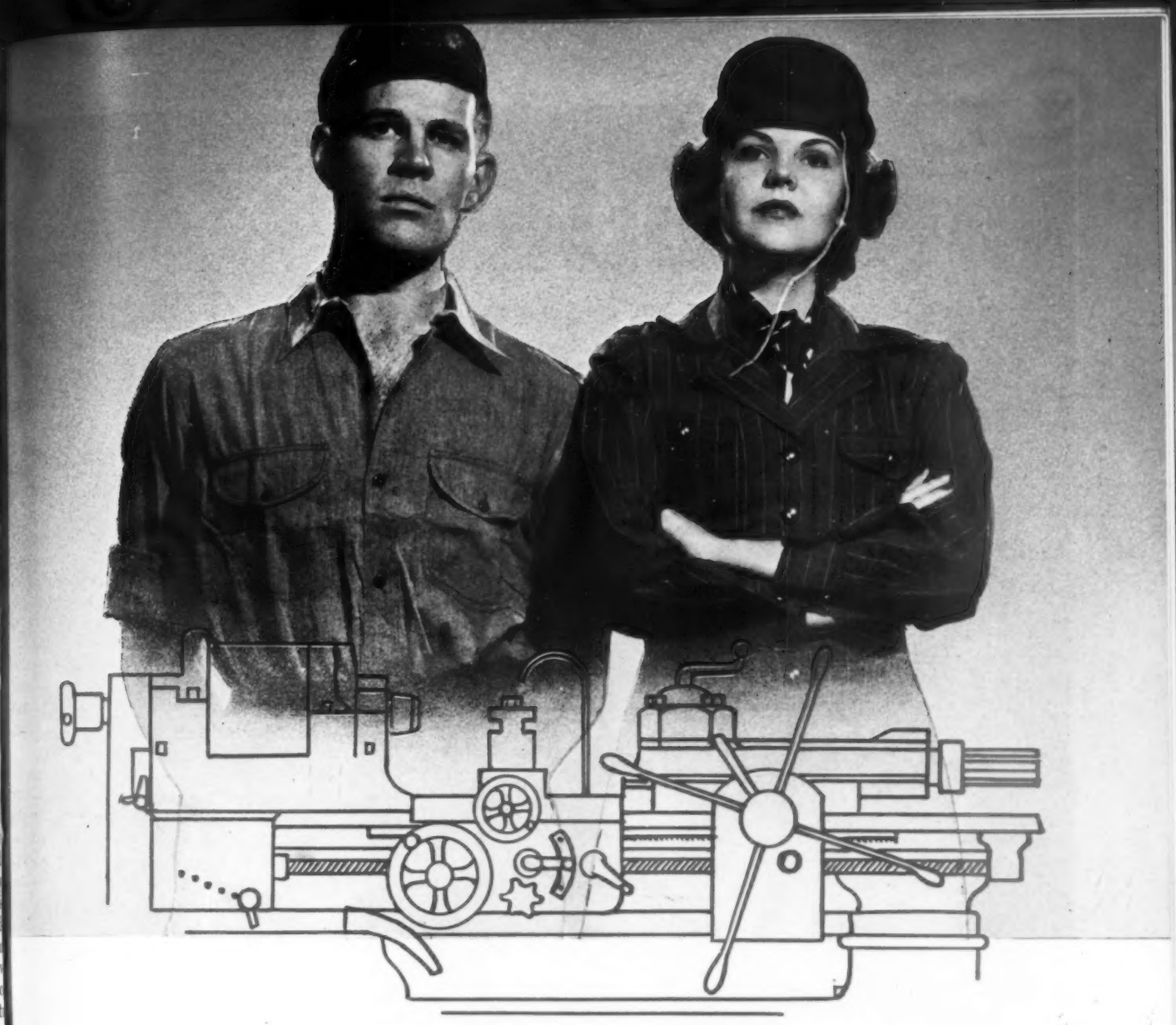
"The first of two things uppermost in the workers' minds," so some leaders lately told me, "is their fear of losing their jobs after the war. Fact is, they fear this more than they fear the Japs. Furthermore, a lot of foremen are so fearful of this that they are now forcing their dues money on us even though we're not supposed to protect them. The second thing is the direct result of the first—namely, the anxiety of every wage earner to get all the hours and all the money, also the best promotion, he can now while the getting's good."

Accordingly, some of the union papers now headline the promise that "We'll work as vigorously to speed peacetime re-conversion as we did for war conversion." In addition, hard dickering is now going on in many places to remedy the "gross inequalities" still believed to afflict individuals and small groups within the WLB's near-freeze of basic wage levels. More intense than ever, also appear the efforts of many leaders to obtain a larger share of managerial responsibility and, generally, to increase and solidify union prestige. ("Praise the CIO and pass the ammunition!")

Big opportunity also exists for many leaders to crowd management for the most favorable interpretation of this or that simple-looking but complex directive and executive order. These heads appear to figure that, if war conditions prohibit higher pay for work done, chances may favor following the experience of the Railway Brotherhoods for developing "feather-bed rules" requiring full pay for work not done.

Nevertheless, more than a few leaders appear to be seriously pondering the possibilities of meeting the present puzzling situation with less friction and more cooperation.

Thus a number of organizations enjoying maintenance of membership without the check-off are hesitating to request their employers to enforce this clause by discharging former members who neglect to pay their dues. These leaders appear unconvinced that, considering the prevailing scarcity of workers, the War Labor



A Help on Your Job... Because Chewing Helps the People Who Make the Goods With Which Our Fighting Men Win the War

Chewing Gum's Relief from Tense Nerves, "False Thirst," Saves Man-Hours. Helps People Feel Better, Work Better

Only People Can Win This War!

The machines are vital but they are mere lumps of dead metal without people to run them. People with the will to win—people with high morale and healthy nerves.

Because chewing gum helps the human side of the machine—people—it has taken on a new job—a war job. Scientists have found the basic reasons why chewing helps people feel better, have steadier nerves and work better. They have traced the results in laboratory tests.

And they have found why chewing relieves false thirst—dry mouth and throat that pester workers and send them on "sip-trips" to drinking fountains—even when the body wants no water. And in hundreds of war plants, production managers find chewing relieves the craving to smoke, where conditions make it impossible to permit it. And how it helps lessen fatigue and lifts morale.

Also they find that chewing fights drowsiness, helps keep workers alert and reduces accidents. In these ways chewing gum saves many man-hours now wasted.

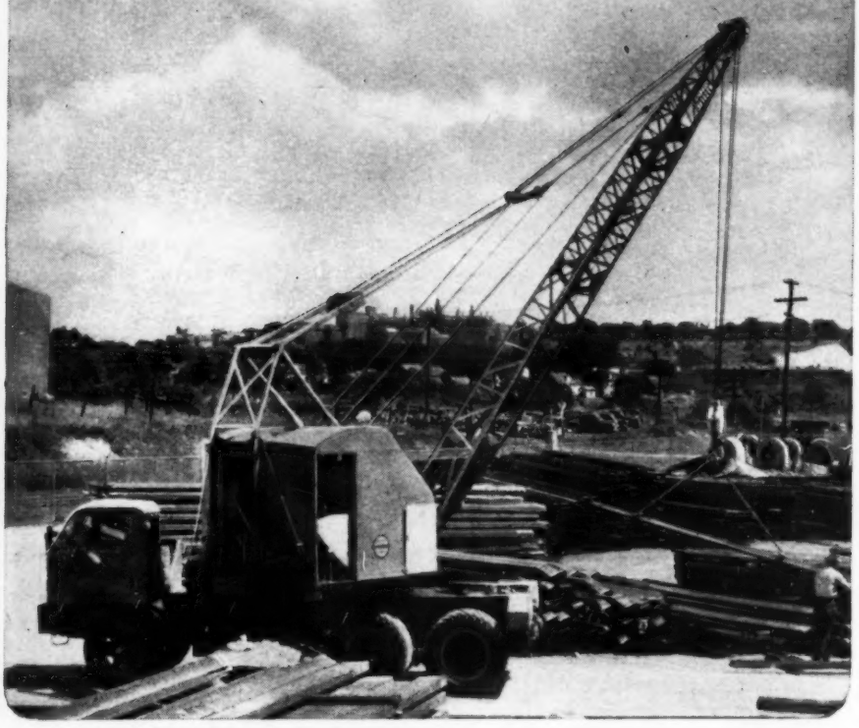
And the Armed Forces and people everywhere are finding out how they benefit from chewing gum. That nerve tension is eased and the task goes easier, faster. And so the demand for chewing gum is outstripping our capacity to produce it.

But we are doing our best to get gum to you—in short to get it to the places it will do the most good. That is why we say to you important production people: "If you want to salvage man-hours and help the human side of your machine feel better and work better, see that they have chewing gum on the job, as hundreds of war production plants now do." And we will do our best to get it to you. For only people can win the war.

Wrigley's Spearmint Gum—A Help on Your Job

moving something that's

BIG & BULKY?
ODD-SHAPED?
HARD-TO-HANDLE?



A Powerful
LINK-BELT SPEEDER
will Do The Job . . .

Quickly, Easily and Economically You can load and unload, stack or move materials quickly with a versatile, easy-to-handle Link-Belt Speeder crane. These rugged units are built to stand the gaff—built to get the job done—built to keep a step ahead of today's high demands . . . yet they respond instantly and surely to effortless control. Eliminate your materials handling delays with this dependable, time-saving equipment. Wheel Mounted—Crawler Mounted or Pedestal Mounted in many sizes from 4 to 50 tons.

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BUILDERS OF THE MOST COMPLETE LINE OF
SHOVELS-
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(A DIVISION OF LINK-BELT COMPANY)

Board will stand up to the unpleasant job of ordering these delinquents to be fired by an employer who insists that this embarrassing responsibility lies less with him than with the board and the union. "Can't we, Mr. Employer, find some way of working this out together?"

In certain other organizations, even the hotheads are wondering whether their usual "tough" tactics will not make the union unattractive to the new incoming crop of women employees. Still others question whether aggressive enrollment of the new workers may not unduly complicate their job of protecting the older members once the latter return to their old jobs after the war.

Still others of the hardest-headed local committee chairmen are evidently puzzling how they can personally get the best possible job "while the getting's good." Now that their union has approached its maximum, slight opportunity exists for a fat salary at International Headquarters—an opportunity which, incidentally, made more than a few local organizers raise Cain in the hope of catching Headquarters' eye. At the same time the same seniority that seemed a great a blessing when times were hard now hinders their ability to market with other employers the talents for leadership which these men developed in their committee work. To quote some ex-fire-eaters:

"We union officers used to oppose management's habit of making foremen out of our leaders and stewards. In that way, you see, they could bust our union by constantly skimming off our best men. But now we think mebbe it's a good idea. The trouble is, to make it work, *we and management should have a lot more confidence in each other!*"

Favorable Conditions

Certainly those who voice such a surprising wish could hardly hope to find conditions more favorable than the present to its fulfillment. Their members, actual and prospective, are convinced that "This is our war" and genuinely want to help win it. For the moment, at least, they see no point in battling for either job protection or higher 'cross-the-board wages. (Or, if they do, the necessity of enforcing present agreements only puts their leaders all the more on the same side of the table with management.) Meanwhile, the same government that aided and abetted the leader's battle against the employer is now not only announcing "End of the line!" but also urging worker, leader and employer alike to help save the country by practicing cooperation.

Perhaps most important of all, ev

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Here is the sander you want and *need*... the NEW "Sterling-1000" Electric Sander.

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Orbital, circular. Thousands of abrasive grains cross and recross each other's paths with whirlwind speed and a *fast cutting,* scrubbing action that yields the smoothest surface you ever saw, on wood, metal, plastic, or composition. Excellent, too, for many rubbing and polishing operations.

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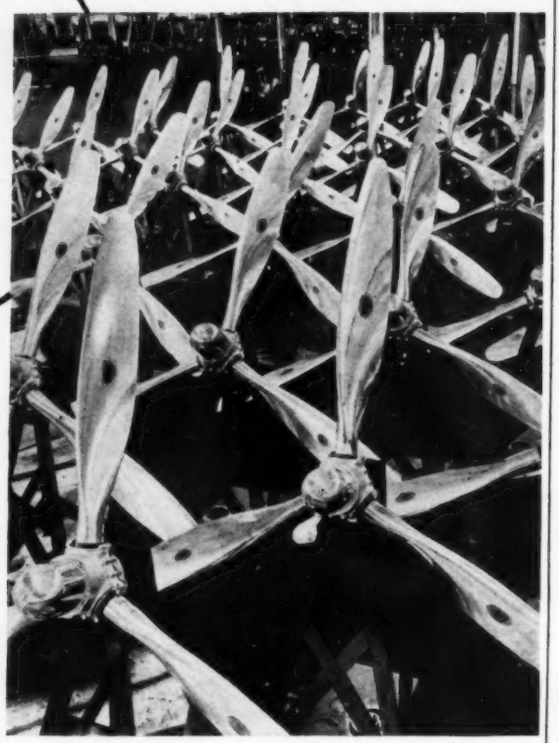

An
Intricate
Finishing Job Well Done . . .

Intricate because dynamics as well as appearance had a very definite bearing on both the finish and the method of finishing. Lea Engineers helped the management of Hamilton Standard Propellers, East Hartford, Connecticut, work out a practical method for producing the proper smooth, satin finish suitable for final anodizing or painting. Use of Lea Methods and Lea Materials are now standard practice on all aluminum blades, domes and steel hub parts.

Assisting war industries with their finishing, polishing and burring problems is the business of Lea Technicians.

THE LEA MANUFACTURING CO.
Waterbury, Conn.

Burring, Buffing and Polishing - - - Specialists in the Development of Production Methods and Compositions

2-LM-1

actly that kind of practice is, as a matter of actual fact, now going on in thousands of plants across the country. Even where union rules or covert union instructions still restrict output, committees of union and management are working together in selling bonds, collecting scrap, salvaging materials, securing supplementary gas rations, stimulating suggestions, arranging rallies, etc., etc. To be sure in few fields is oratory so easy as in cooperation—and so futile. But, just because its actuality is so much harder than it looks, few causes respond so satisfactorily to *continued* practice. Whether anybody likes it or not, month after month of it is certain to bring, unconsciously, the fulfillment of that wish for "a lot more confidence in each other."

To solve its problem, will labor move to the right, become more responsible and cooperative? Or will it seek to justify itself by scraping the barrel all the harder for "beefs" and technicalities of every variety?

Time Will Tell

Only time will give the answer. But it does look as if union victories and the war, plus the recent elections, had brought the labor problem to a stage of something or other. That being so, it would seem a bit less futile than usual to do a little "iffing"—like this:

1. *If I were a big shot labor leader,* I think I'd do some serious figuring whether I could not improve my organization's public relations and beat Congress to the draw and volunteer to set my house in order by pledging my union to abstain from political contributions, to make its constitution and practice thoroughly democratic, publish its financial reports, abolish worker intimidation, and protect members against union injustice by unprejudiced courts of appeal.

2. *If I were an employer,* I think I'd ponder how I could allay workers' fears of post-war unemployment and confusion, justify their hopes, and build their pride as fellow war-winners, at the same time demonstrating full willingness to continue to play ball with a reasonable union both during and after the war. (Incidentally, I'd greatly reduce the number of company lawyers at the negotiating table.)

3. *If I were a federal legislator,* I think I'd get busy on some laws calculated, not to destroy or afflict unions, but to make them non-political, democratic, and responsible—the honest, intelligent, and farsighted representatives of the world's best educated, most reasonable, most individual, self-respecting, and hopeful wage earners.

SERVING THE ARMED FORCES

"...This award is your nation's tribute to your patriotism and to your great work in backing up our soldiers on the fighting front."

Under Secretary of War

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These heavy-caliber fire power, armored turrets protect our Army-Navy Bombers and Torpedo planes against enemy fighter aircraft.

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The fighting power and split-second maneuvering of modern war planes depend upon precision-built electric motor controls.

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ELECTRIC FANS

The most complete selection of quality Fans in America, with the famous 5-Year Guarantee, inaugurated in 1914.

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For household, farm, commercial and industrial appliances and labor saving machines.... Also, for aircraft controls.

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Kitchen ventilating and attic cooler fans for homes. Exhaust and ventilating fans for industry and commerce.

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The most modern of metal fabricating methods is made universally available through these compact, portable units.

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Uncle Sam's Fighter Planes

X-rayed in the field by delicate equipment that rides protected on

GENERAL JUMBO JRS.

THIS Triplett & Barton portable X-ray trailer is an important aid to inspection and service in the field . . . an "ounce of prevention" worth *tons* of cure! Pictures of "suspected" parts are taken and developed on the spot . . . decisions made at once to save lives, planes and costly overhaul time. Another place where General Jumbo Jr.—industrial pneumatic tire favorite—is doing a special job for Uncle Sam!

But, whether the job is routine or special . . . horsing heavy industrial truck loads, hurrying personnel through huge plants via "scooter cycle" or safely speeding delicate equipment . . . the General Jumbo Jr. tire-tube-wheel combination is always the team to pick.

For General Jumbo Jr. *can take it* . . . cushioning loads . . . protecting load, floor and conveyance alike against damaging jolts and bumps. And Jumbo Jr. is a *safer* industrial tire. Its exclusive wide rim design assures extra stability. The tire will not pick up metal clippings, chips or filings from the floor! Jumbo Jr's life is greater . . . traction better on every surface.

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Tires 8" to 24" overall diameter. Load capacity 100 lbs. to 1500 lbs. per tire. 2-4-6 and 8-ply with separate tubes and the heavy duty wheel. Available in new Air Corps specification sizes. Also for war orders and essential industrial use.

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GENERAL JUMBO JR.
INDUSTRIAL BALLOON TIRES

Machine Load Board Keeps Plant in Balance

(*Continued from page 82*)

cates the vast amount of information that has been dug out of paper forms and brought out into the open. Now oversight is less likely to be the cause of a bottleneck, or lack of balance, in the next six months.

Although only two are shown in the picture of the board, there are actually four columns of machine names. The name of each type of machine is printed on a 1x12-in. cardboard strip and is placed in its appropriate group —automatics, for example. To the right of the machine name is a column headed up for every machine department in the plant. (These department columns are necessary because a certain machine may be required in more than one department.) Next comes a machines-ordered column, followed by the second column of machine names, and so on across the board. Cross-section spaces are formed by string stapled to the face of the board; each space is 3 inches long by 1½ inches high.

Within the cross-sectioned space to the right of each machine name, and under each department in which such a machine is located, is hung a cardboard strip 1x2¾ inches. These strips contain the postings which indicate the machine requirements for the prospective schedule.

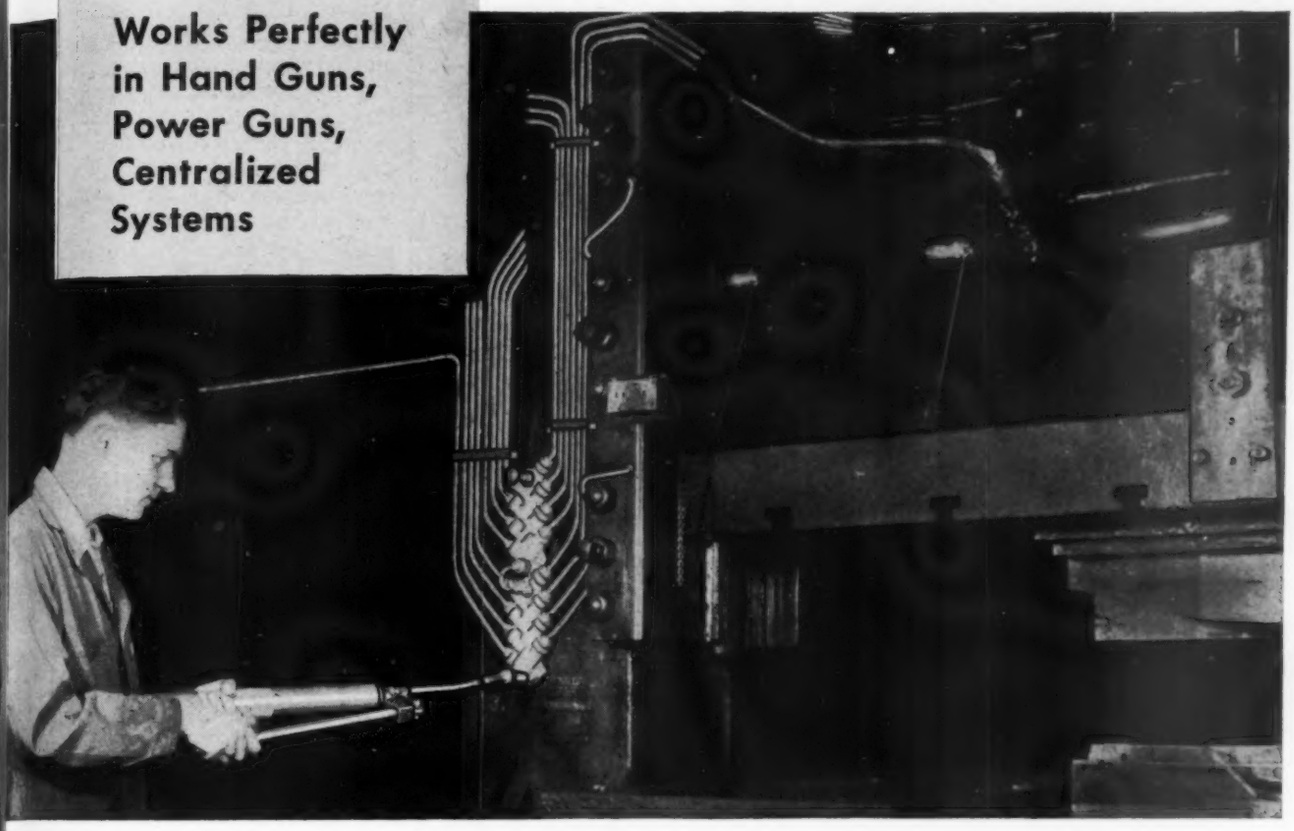
Two numbers are stamped in large figures on these cards. The first indicates the number of machines in the department; the second indicates the hours scheduled for that machine. Capacity figures are posted in terms of three shifts, giving a total of 24 hours of machine capacity per day. If, for instance, one of these departmental machine strips contained the numbers 2–29, it would mean that there are two of this particular machine in the department, and that only 29 hours are scheduled against them. Since two machines have a total capacity of 48 hours there is ample capacity to meet the schedule.

Red and black figures on these cards are used to indicate varying conditions of over- and undercapacity, as follows:

1. *First figure red and second (hours of capacity required) black.* This indicates that the machine in question is a single-purpose machine and that there is no overload. It is unnecessary, therefore, to invest in additional equipment.

2. *First figure black and second, or hour, figure red.* This indicates that

HOW ONE PRESSURE GUN LUBRICANT REPLACES MANY...AVOIDS CONFUSION



Alemite Solidified Oil Is Impervious to Water— Won't Separate in Guns or Clog Bearing Grooves!

THERE'S enough confusion in war production plants these days, without the added difficulty of having to choose from more grades of lubricant than are necessary, every time you load a grease gun! Thousands of plants have found that Alemite Solidified Oil replaces several other lubricants—serves perfectly in hand guns, power guns, and centralized systems—avoids confusion and saves precious time while guarding bearings dependably!

Alemite Solidified Oil No. 32 meets a wide range of operating conditions. It is impervious to water—will not harden, oxidize, or separate—cannot clog guns or bearings or corrode highly polished bearing surfaces. Unexcelled for machine tools, stamping presses, conveyor rolls, line shafting, sheaves, stokers, and a multitude of other uses. *One pound, properly applied, will afford more efficient lubrication than two pounds of ordinary grease!*

If your equipment calls for a heavier bodied lubricant, Alemite No. 33 is made for you. And where machines must operate in extreme cold, Alemite Sub-Zero meets every requirement.

ANSWERS HUNDREDS OF LUBRICANT QUESTIONS

Write for your FREE copy of the Alemite Industrial Lubrication Manual, containing specific recommendations for meeting literally hundreds of lubrication problems. Invaluable for superintendents and maintenance men. Ask for it, on your letterhead, today!

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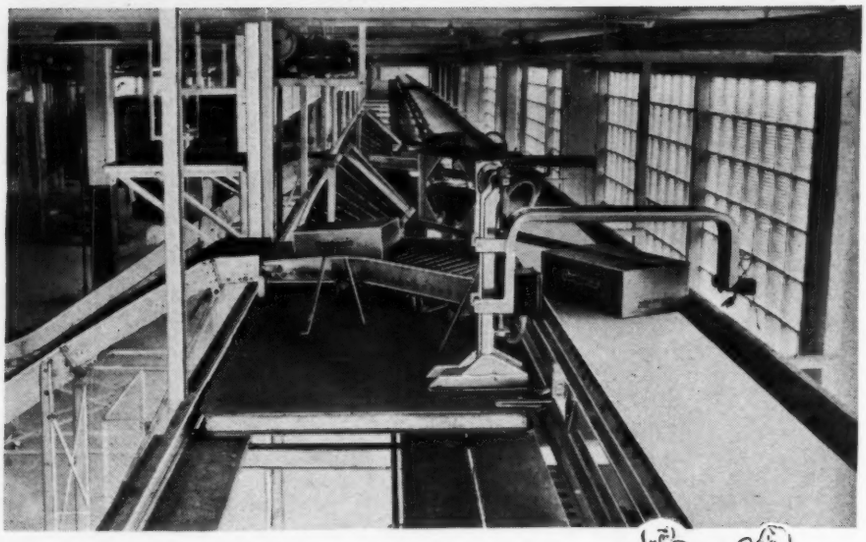
Industrial LUBRICATION

1870 DIVERSEY PARKWAY, CHICAGO, ILLINOIS • BELLEVILLE, ONTARIO

Ask Anyone in Industry!

Here's one "Post-War Miracle" YOUR PLANT CAN ENJOY RIGHT NOW



IT'S AMAZING! — to watch these photo-electric eye deflectors select the proper cartons as they travel along this 250-foot Alvey-Ferguson Belt Conveyor and distribute them to either storage or shipping rooms.

Think how this "scientific miracle" *working for you* in *your* plant could *speed your production* by sorting your products en route through your plant—and without a mistake.

To the *public*, many of industry's new "scientific miracles" will not be available until the war is won—but—

If your plant is manufacturing war materials or products regarded as necessary for the war effort, you can secure an A-F Conveyor System scientifically designed and expecially engineered to fill your needs *NOW!* With few or no changes it will also help you produce more efficiently in the post-war era.

In the past 42 years Alvey-Ferguson engineers have installed practically every type of "endless-stream" conveyor system. Whatever your "indoor transportation" problem may be, write us at once and we will help you solve it! Or write for new, illustrated folder featuring A-F Conveyors in War Plants.

THE ALVEY-FERGUSON CO., 132 Disney Street, Cincinnati, Ohio

CONVEYING MACHINERY A-F

ALVEY-FERGUSON *Conveyors*

AND PRODUCTS WASHING MACHINES

machines are interchangeable, but there is an overload against that equipment in the department. If the first figure were 2 and the hours required for the next six months 90 a day, the figure 90 would be red. This shows that two additional machines are needed to handle an overload of 42 hours (90 — [24 x 2]). The machines-ordered column now comes into play. The two machines, when ordered, are stamped on a cardboard strip for this space. A continued red figure on the department machine strip without a corresponding strip in the ordered column would be, of course, a danger signal.

3. *Both figures black.* In this case the machine is not single purpose—and the capacity is ample for the prospective schedule.

4. *Both figures red.* Here one or more machines are single-purpose and there is an overload on some of the machines. To tell which machines are overloaded requires an analysis of the machine load sheets (see page 82) for the department in question. Appropriate action would then be noted in the machines-ordered column.

It is implied here that a new machine is ordered when the hours required by the schedule show up red. This is not necessarily true—two moves may make a purchase unnecessary. First, the tool engineering department, the standards department, and the supervisor concerned make every effort to avoid buying a machine by re-processing or by a change in tooling. Second, a machine in one department may be overloaded, but the same kind of machine in another department may be underloaded. In this case the routing of the part would be shifted, if possible, to the latter machine. The point to be emphasized is that these conditions are disclosed at a glance. The correct condition is, of course, for the load figure, the second on the machine strip, to be black.

Schedules are varied. The plant is expected to step up production as of a certain date ahead—six months has been used as an example. The board is then posted to indicate the status of equipment to meet the projected schedule. Figures in the machines-ordered column indicate the number of machines ordered and for what particular schedule they were ordered. For example, 3-3 on the cardboard strip with the first figure black and the second red indicates that the original schedule called for three machines; a subsequent schedule increase required three additional machines.

Perhaps enough has been said about the mechanics of the board and its

Johnny's gone off to war

WHILE CARDINEER HOLDS THE HOME FRONT!

Yes indeed, CARDINEER releases manpower for our fighting forces—releases men and women for other jobs on the home front. And besides, CARDINEER is in service in the army, in the navy—wherever war-active records must function with speed and split-second efficiency.

CARDINEER'S wheel principle of bringing thousands of records to the operator's hand speeds processing and reference 60% or more; it saves time, saves space, saves money, and moreover—CARDINEER is *available now—immediately.*

DIEBOLD SAFE & LOCK CO. · *General Offices, Canton, Ohio*

GET YOUR FREE COPY!

PRODUCTION ☐, a specially prepared booklet shows exactly how to speed manufacturing control. CARDINEER SHORT CUTS ☐, an authoritative time-motion study of Cardineer's wheel principle. Other free booklets: INVENTORIES ☐, COSTS ☐, PAYROLL AND PERSONNEL ☐, PLANT AND EQUIPMENT ☐, P. R. P. ☐, PURCHASES ☐. Check those of interest and mail today to Diebold's Methods Div., Dept. F-2.

DIEBOLD *Cardineer* **ROTARY FILE**

Engineering helps to win wars!

Successful military campaigns can be planned only with the assistance of military engineers. And only industrial engineers can successfully design industrial truck casters that stand up to the pace of modern war production.

Engineered to Fit Today's Production!

BOND 36-A CASTER. *Basically different in design, this caster combines easy swiveling with long service. The "reason why" lies in the arrangement of its ball races and its use of durable Bond Caster metal. Pressure lubricated throughout.*

BOND was the first to *engineer* industrial casters to fit the job. Every Bond Truck Caster is designed and built for the conditions it meets in actual operation. That's why Bond Casters speed materials handling . . . help you speed war production.

BOND FOUNDRY & MACHINE COMPANY, MANHEIM, PA.

Bond* TRUCK CASTERS

* Reg. U. S. Pat. Off.

functioning to indicate the time saved by its use. It serves an additional purpose: Line supervisors constantly consult it to get a picture of the status of their departments; if undercapacity at some places is indicated, they are in a position to cooperate with the staff departments more effectively.

Employers Should Form Unions

(*Continued from page 89*)

stacle in the path of effective employer organization is the unavoidable fact that by joining in negotiations with other employers, a businessman must, of necessity, largely forfeit the right to determine the labor policy of his own firm, and also the right to change that policy if and when he chooses to do so. It does not mean that he no longer has a voice in the labor policy of his company, but it does mean that his policy must conform, in principle at least, with the labor policies of all other employers with whom he associates himself. It means also that to abandon the group policy in favor of another which at the moment may appear more expedient is to violate the basic tenet of employer unity. Descending from a long line of rugged individualists, whose brains and initiative built and fought for free private enterprise, employers of today have naturally been somewhat reluctant to modify their labor policies, or any other policies, for the sake of employer unity of any sort.

Nevertheless, the individual employer's independence proved to be his weakness when it came to threshing out a collective bargaining agreement with a union. By tackling first one employer then another, organized labor has made great inroads on the very prerogatives management has held so dear.

When One Holds Out

What happens when one employer in an industry deserts the group policy and makes a side deal with the union to avoid a work stoppage, has been demonstrated almost annually in the Minneapolis milk industry. Some 20 milk distributors in Minneapolis customarily deal as a unit in collective bargaining with the milk drivers' union. They are not members of the local employer "union," but they do attempt to present a united front in negotiations, and arrive at an agreement that uniformly applies to all of them. Their trouble has been that one of the distributors is a cooperative

Helping American War Industries to PROTECT MANPOWER

is an important part of our **WAR TASK**

How Benjamin Lighting Equipment is Being Used to Help Promote Safety, Combat Fatigue and Conserve Manpower

There are 3 major ways in which the right kind of lighting as provided by Benjamin Lighting Equipment is helping American Industry to meet the manpower problems involved in war production.

+ 1. It protects plant personnel against accidents
+ 2. It conserves energy and reduces fatigue
+ 3. It helps older employees to "stay on the job."

1. SAFETY. Today the Safety problem is accentuated by the influx into industry of new, inexperienced men and women, many of whom are unaccustomed to industrial occupations, and by the increase in the average age of the working force. Also, demands for sustained, high speed production and day and night shifts have increased the problem of fatigue as a cause of accidents.

Good Lighting is helping in the solution of this problem in two ways. First, enough light enables the individual to see hazards easier and more quickly.° It takes time to see.** The more light the less time required to see and to act.** The fewer accidents!°°

Second, Good Lighting makes seeing easier and less tiring. The elimination of direct and reflected glare, deep shadows and spotty lighting, and the provision of sufficient light, properly directed, diffused and uniformly distributed help minimize eyestrain and fatigue,*** the enemies of alertness against accidents.

2. FATIGUE. Not only is fatigue the cause of accidents but also an important factor in rate and quality of production, absenteeism, health and morale. Lighting is helping to solve the fatigue problem by reducing the drain on the worker's reserve energy. For seeing requires energy!*** The better the lighting, the less the drain.***

3. OLDER EMPLOYEES. Good Lighting benefits the older employee and those with deficient vision of all ages even more than those with normal vision. **** More light helps compensate for visual deficiencies and the loss of visual acuity due to age. Given this additional light, the manpower represented by this large group can be conserved and efficiently utilized for war production.°

+ For data and case reports on the value of Good Lighting, send for the new report of the Illuminating Engineering Society, "Value of Good Lighting in War Production—A Survey of Opinion from a Cross Section of American Industry." For your complimentary copy, address:

BENJAMIN ELECTRIC MFG. CO.
Division N, Des Plaines, Illinois

---

*From I.E.S. Report: "Artificial Lighting in War Production."

**It takes time to see. Tests show that when the amount of light is increased from 1 to 100 footcandles, the speed of seeing is practically doubled.

***Researches reveal that muscular fatigue produced by reading is approximately three times as great after reading for an hour under 1 footcandle as at 100 footcandles.

****In one comprehensive series of tests, those with better eyes were aided 14 per cent by better lighting, while those with defective eyes were aided 22 per cent.

°From Booklet "Plant Efficiency" published by War Production Board.

°°Striking examples of close relationship between quality of lighting and frequency of accidents are not difficult to find. For example, when intensity of illumination . . . in one company . . . was raised from 1.5 footcandles to 19 footcandles . . . the frequency of minor accidents quickly dropped nearly 54%.

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INDUSTRIAL LIGHTING EQUIPMENT
including fluorescent, incandescent and mercury lamp units

EXPLOSION-PROOF UNITS
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MARINE LIGHTING EQUIPMENT
MARINE WIRING DEVICES

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including Sirens, Horns, Buzzers and Telecode Relays

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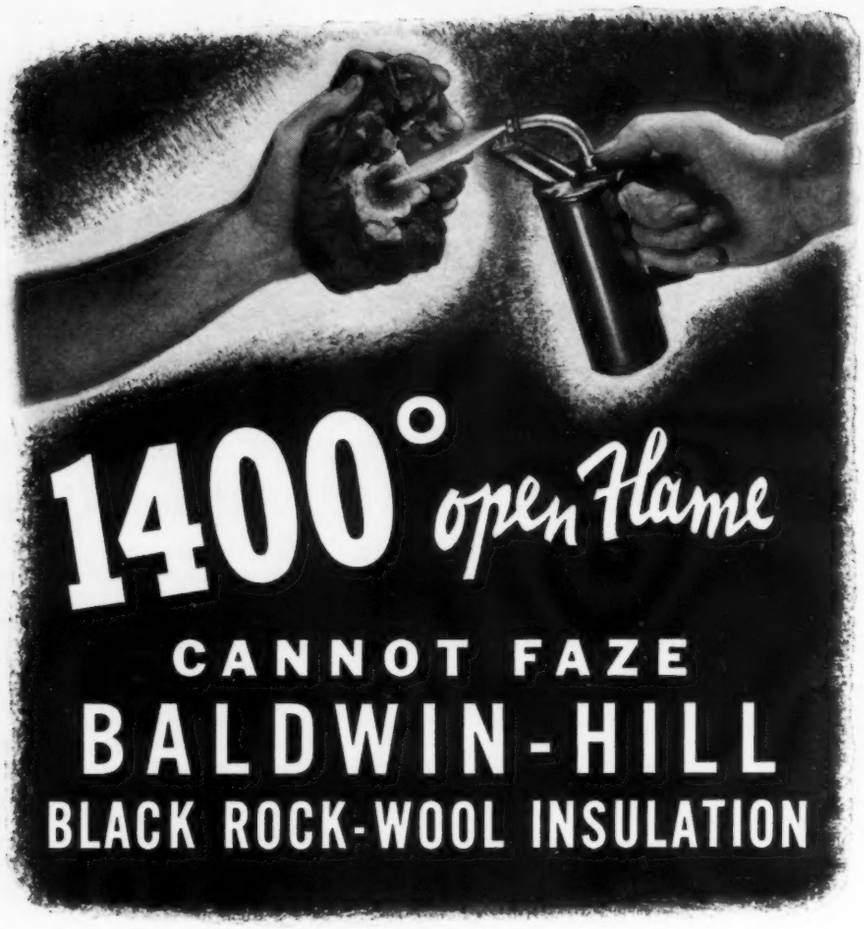
If you have a problem relating to the use of any of the above products, write the Benjamin Electric Mfg. Co., Product Information Department (Division N), Des Plaines, Ill., for data and recommendations. Benjamin services in the solution of such problems are available without cost or obligation of any kind.

BENJAMIN
TRADE MARK

LIGHTING EQUIPMENT



THE HIGH-IRON, low-alkaline nature of Baldwin-Hill rock wool is undisturbed by temperatures as high as 1400°. Exposures which completely remove the resiliency and strength from ordinary rock wool, flames which eat right through white wools, don't touch the strength or insulating power of Baldwin-Hill products. Add to that their stability in the presence of moisture, and you have two vital reasons for investigating Baldwin-Hill wools, felts, blocks, and cements—at once.

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A generous sample square of Baldwin-Hill Mono-Block, the one block for all temperatures up to 1600°, together with a sample of B-H Bond-Tite, the easy adhesive which makes wiring unnecessary. Test for yourself the heat-resistance, the extraordinarily low conductivity, the quick adhesion, and ease of cutting of this universal insulation. Just write us on your letterhead.

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KALAMAZOO

firm owned and controlled by the drivers' union. Naturally, being under union control, this company always abandoned the group policy and entered into agreements in accordance with terms dictated by the union. The union-owned firm also happens to be the biggest distributor of milk in the city, handling about 25 percent of the total volume. Agreements it makes are powerful precedents which all other 19 companies are virtually bound to follow.

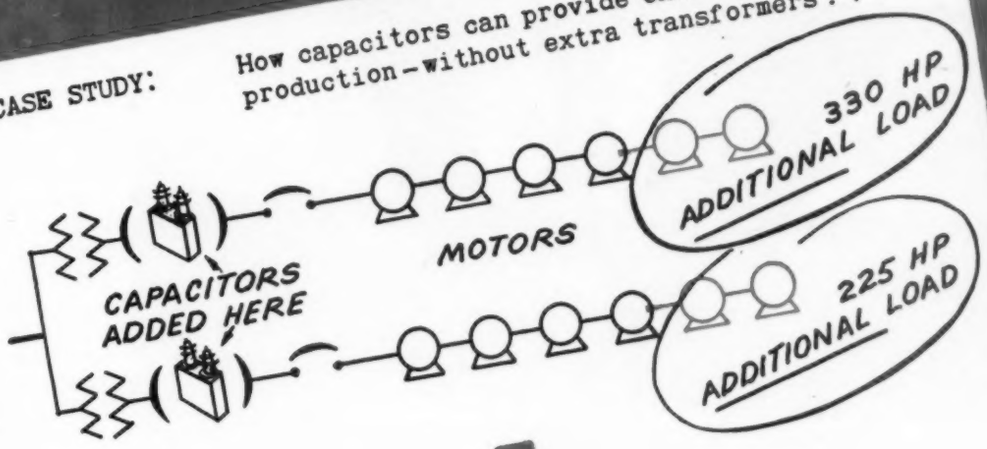
If the other 19 did not consent to an agreement along the pattern of that consented to by the union's own firm, a strike would be called against them. A strike against the other 19 would leave the biggest firm with all the business of the city at its disposal. And that is what any businessman fears most of all in labor disputes. As a result of this lack of unity among the employers in the milk industry, the history of labor relations in that industry has gone from high wages to exorbitant wages; from recognition of the union as sole bargaining agent to a strict closed shop and union hiring hall; from free competition to clauses in the agreement giving the union control over the retail milk prices.

Consumer Pays

The same story is being told today in the automobile and steel industries, where each employer has been subjected to the "pick 'em off one by one" type of negotiation. Until employers in the automobile and steel and all industries learn that labor relations problems are industry-wide and community-wide problems, they will continue to be picked off one by one. Meanwhile the consumer pays the bill in higher prices, delayed production improvements, and demoralizing work stoppages.

What does it avail an employer to insist upon playing a lone hand in labor negotiations, if he is thereby forced to deliver into the hands of the union a large portion of the very management rights he values so highly? Employers know that there is no limit to the demands of organized labor. Each year some additional concession is demanded. The stopping place must come somewhere. Wages cannot go up forever. The maintenance-of-membership shop becomes the union shop; the union shop becomes the closed shop; the closed shop leads to demands for price-fixing or make-work agreements to assure union members employment even though cheaper production or distribution methods may be developed. Every collusive racketeering arrangement engaged in by unions and employers has had a closed-shop agreement at its

CASE STUDY: How capacitors can provide extra power for production—without extra transformers . . .



555 hp ADDED LOAD

. . without adding transformer capacity!

In expanding for war production, this Northwestern parts manufacturer had to add a 555-horsepower induction motor load—more than his existing distribution system, already operating at 88% capacity, could possibly handle. An analysis, however, revealed that application of capacitors would permit the additional load and eliminate need for added *transformer, switchgear, or wiring capacity*. Furthermore:

1. Capacitors could be installed in a fraction of the time otherwise necessary to expand the plant distribution system capacity—thus saving vital war production time.
2. Capacitors would require less critical material.
3. Capacitors would save $200 on the monthly power bill because of the improved power factor—thus repaying their cost within 18 months.

HOW IT WAS DONE:

The plant distribution system comprised two transformer banks, one of 300 kv-a and one 600 kv-a—both operating near capacity with motor loads of 240 kv-a and 550 kv-a respectively. The 240 kv-a load averaged 156 kw at 65% power factor, while the 550 kv-a load averaged 385 kw at 70% power factor.

Application of capacitors increased the power factor to 97% on *both* banks, making available a total of 140 kv-a more on the 300 kv-a bank and a total of 200 kv-a more on the 600 kv-a bank. This made it possible to add a 225-hp motor load on the smaller bank, and a 330-hp load on the larger bank (both at 60% load factor) without any increase in transformer capacity.

J-60514-A

CAN *YOU* USE this method of obtaining more power from your transformers? You can find out, quickly, from your Westinghouse representative.

EVERYBODY BENEFITS from application of capacitors. Users gain both in reduction of power costs and in higher load capacity per kv-a of transformer capacity. Power companies gain additional pay load. The national war effort gains through conservation of power, quick expansion of production facilities and reduced requirements for transformer substations.

REMEMBER, too, that improvement in power factor improves plant voltage conditions. In the case study reviewed on this page, removal of 100 "useless" amperes from feeder circuits greatly improved voltage regulation and motor starting.

A SUGGESTION: If you are planning to increase your motor load—or if you have motor starting trouble or dimming of plant illumination—ask your Westinghouse representative for a capacitor analysis. Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

Westinghouse
CAPACITORS

A BOND OF SECURITY

that is winning Uncle Sam's production drive

Thousands of CM Herc-Alloy Sling Chains are helping to win America's production drive by moving valuable materials such as molten metals, guns, tanks and fabricated assemblies. The added bond of security provided by the extra swell of metal at the weld of these Herc-Alloy Sling Chains gives industry an extra margin of safety and wear. *Herc-Alloy Chains, made from special analysis steel, never require annealing.* Engineering catalog No. 44 will be promptly sent on request.

CM HERC-ALLOY
SLING CHAINS

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INVEST REGULARLY IN VICTORY—BUY WAR BONDS AND STAMPS

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base. That is a matter of record in the history of our labor relations.

We have all heard of CIO's industry council scheme, by which organized labor would be given a voice in management equal to that of the employer. But have any of us heard of any scheme to give the employer a voice in the affairs of a union equal to that of union officials? If you ever have, forget it. Such a scheme would be illegal. CIO's plan, however, is perfectly legal, and even has the active backing of some high government officials. It shows to what ends a union will go if it sees its way clear. The management of a plant and collective bargaining are two distinct functions. Even CIO admits this. Yet organized labor, through sheer noise and coercion, has wrested other rights from the unorganized employer, so why not wrest away the right to manage as well?

How much wiser and easier it is for an employer to retain his management rights by voicing his labor policies through an organization of his fellow-businessmen. Isolationism in labor relations does not pay off any better than any other kind of isolationism does.

Only Human

Please do not misunderstand. Organized labor is only being human in demanding more and more concessions from the unorganized employer, just as some employers formerly demanded more and more from their unorganized employees. Naturally, any powerful force will roll on and on until it is brought to a halt by another force equal to it. Management groups such as those talked of here would probably also go to excesses if labor were not organized to protect its rights. What is needed is a balance of power between organized labor and organized management. Once each grows to accept and respect the other's rights, and police the other's responsibilities, this nation will enjoy labor peace. Let this discussion never be interpreted as a plea for some organization to undermine and destroy organized labor. All that is needed—and it is desperately needed—is organization of management, to protect its own domain and insist upon responsible conduct of the affairs of employee organizations.

Collective bargaining and labor organizations came into being only when it was realized that by collective action employees may band together to negotiate wages and working conditions with their employers, whereas the individual employee has little or no power or influence with which to drive a bargain. Today the situation is reversed. Now it is the individual em-

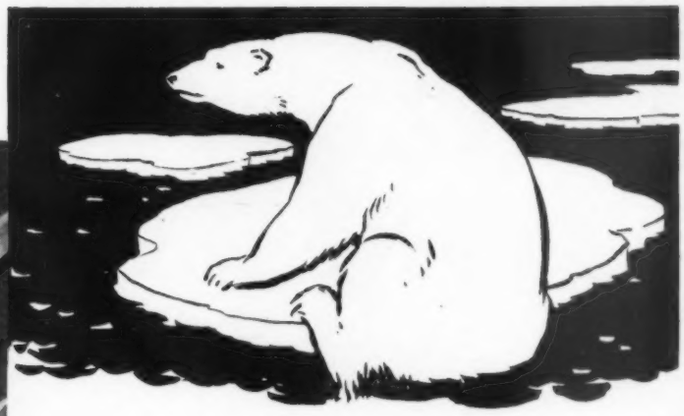
ployer who is helpless when faced with the demands of a powerful, rich, and politically influential labor union. What equality of bargaining power is there between a small businessman and an international labor union?

Real collective bargaining, therefore, will not attain full bloom until employers, like employees, are organized on both an industry-wide and a nation-wide basis for purposes of negotiation with labor unions. This assertion is supported by a recent statement of William H. Davis, chairman of the National War Labor Board, who wrote: "It seems to me that what we principally need is more organization among employer and management groups. Such organization would do much to promote an equality of bargaining power between management and labor." Davis added that industry-wide collective bargaining "makes for greater stability throughout an industry, more responsible unions, and puts management on a more fair and equitable competitive basis as far as its wage costs are concerned."

To Assist Employers

Although the average citizen is probably unaware of it, almost every large city in the country already has an employer organization of some sort. That does not mean a chamber of commerce. It means an active, forward-looking employer "union" attempting to "organize" the city and assist all employers in their problems of employer-employee relations. The activities of these organizations range all the way from the collection and dissemination of wage data and research in industrial relations to actually negotiating agreements in behalf of their members. Regardless of what their activities may be, these local organizations are the nucleus of what could well be transformed into a powerful American Federation of Employers. Employers' unions such as the San Francisco Employers Council, Associated Industries of Cleveland, Associated Industries of Billings, The Industrial Conference Board of Tacoma, St. Paul Committee on Industrial Relations, and Associated Industries of Minneapolis are the only existing sources of effective employer representation in labor disputes. United, they would do the job that individual employers, no matter how diligent, could never do.

Yet, these organizations have just begun to blaze the trail. None of them can claim as members all the employers of its community. Some of them have nearly every employer enrolled, or at least an overwhelming majority, but they still have the problem of persuading their members to



Reduce

Slipping and Falling Accidents by Using

INLAND 4-WAY FLOOR PLATE

WRITE FOR BULLETIN.

INLAND STEEL CO.

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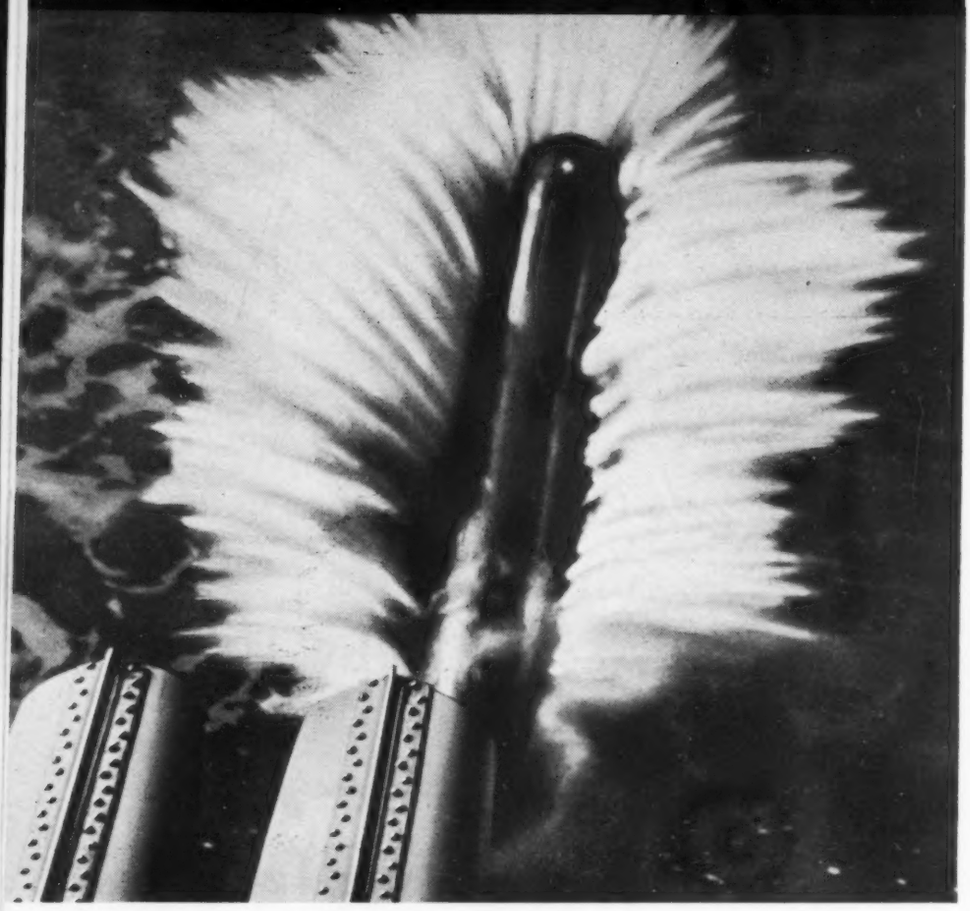
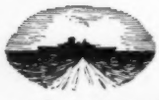
SALES OFFICES

MILWAUKEE DETROIT ST. PAUL ST. LOUIS KANSAS CITY

A "TIN FISH" TAKES TO WATER



Buell Dust Recovery Systems helped produce it!



That "tin fish" (torpedo to landlubbers) is an intricate mechanism of more than 10,000 parts. Some of these parts are forged; others, like the propeller, are cast; but all must be machined and finished to the finest tolerances...and uncontrolled dust anywhere along the line might seriously impair accuracy. That is why Buell Dust Recovery Systems have so many uses in modern industry.

In foundries, for instance, Buell Dust Recovery Systems are used to control dust in conjunction with shake-outs and the grinding and rough finishing of castings. With machining operations, Buell equipment efficiently eliminates a hazardous nuisance. In many installations, Buell's big job is the recovery of critical materials that would otherwise be lost as dust.

Only Buell Dust Recovery Systems use the patented van Tongeren cyclone—an ingenious "shave-off" design that permits exceptionally high recovery efficiency at low operating cost. Buell cyclones have no moving parts and require practically no supervision because large openings prevent clogging. Buell equipment is built for long life and trouble-free service, and installations can be made to handle any gas capacity from 300 c.f.m. up.

Memo to:
EXECUTIVES & ENGINEERS
Buell Dust Recovery Systems are widely used in
CHEMICAL & PROCESS INDUSTRIES
FOUNDRIES & MACHINING OPERATIONS
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and other industries for the elimination of hazardous dust nuisances and the recovery of critical materials.

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Factual 28 pg. book. Write for Bulletin FA-2.

BUY WAR BONDS AND MAKE THE AXIS BITE THE DUST

utilize the services to which membership entitles them. The unions are constantly trying to circumvent the employers' association and bargain with the employer directly.

Employers themselves weaken their own organizations by refusing to permit representatives of employers' associations to be present during the negotiations, going to the association only for advice which all too frequently is not followed anyway. As a result, the case of the employer who, under the pressure of high-powered bargaining by experienced union leaders, breaks down and agrees to clauses and provisions that are bad in principle, is entirely too common. Such employers are costly and damaging to the rest of their industry and to the entire community. When negotiations are handled by the employers' association, the employer literally has his own business agent present, who is just as experienced and proficient in the intricacies of collective bargaining as the professional union agent.

Bitter Strife

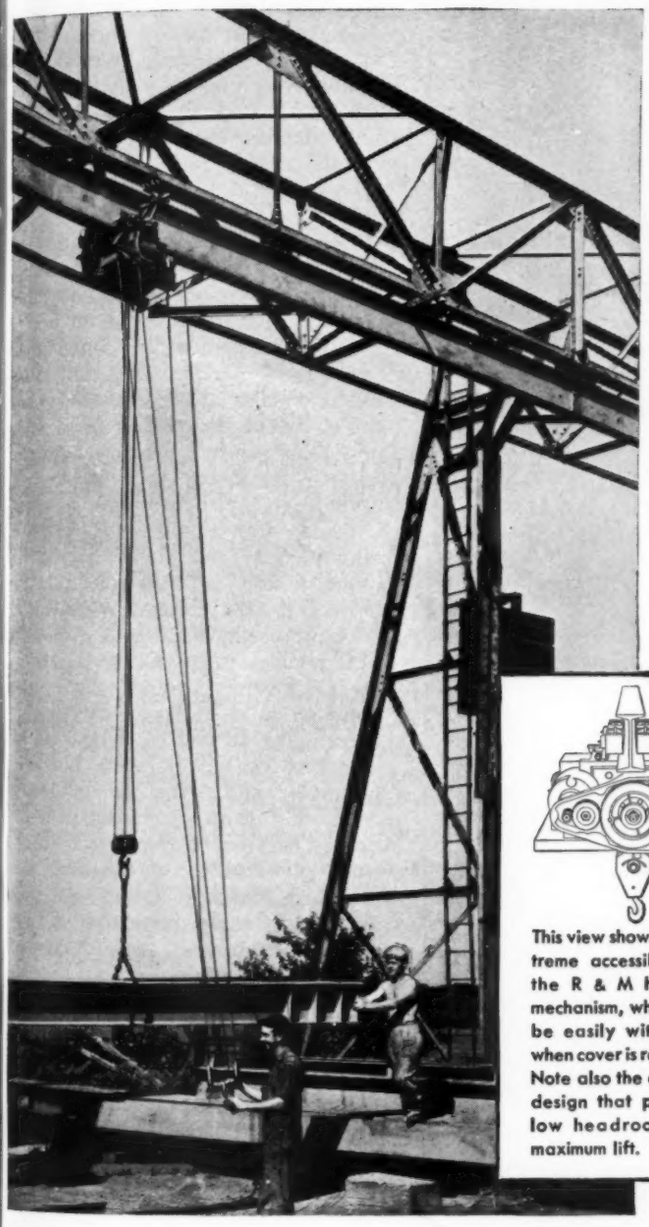
Nowhere in the United States are the benefits of employer unionism more appreciated than they are in San Francisco. Having been the scene of some of the nation's most bitter industrial strife in the '30's, San Francisco acquired the dubious honor of being the toughest labor town in the country. Employers and citizens alike were well on their way to becoming completely subservient to the will of local labor bosses. Just when things seemed to be at their worst, the employers organized their own union. Students of labor relations were heard to remark that united action by San Francisco employers would probably lead to more strife when the employer union began fighting labor unions. Even some employers were openly antagonistic. Experience has demonstrated that the observers were wrong.

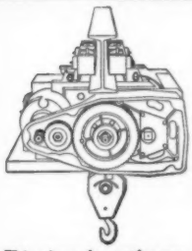
Every employer in the city was classified into an industry group—the hotel employers, the draymen's and warehousemen's association, the restaurant employers, etc. These industry groups were all knit together in a central group known as the San Francisco Employers' Council, headed by one of San Francisco's leading citizens, Almon Roth, former comptroller of Stanford University.

The Solution

How did the employer union solve San Francisco's problem? Let us take the restaurant industry as an example. For several years the restaurant employees' union had been in the practice of presenting to every restaurant owner a small card on which were printed the terms and conditions

6 R & M HOISTS Speed this Firm's War Work!





This view shows the extreme accessibility of the R & M hoisting mechanism, which may be easily withdrawn when cover is removed. Note also the compact design that provides low headroom and maximum lift.

Racing against time on grueling day and night production schedules, R & M All-Steel Hoists are winning performance and endurance citations in war-busy plants everywhere.

Their record for this large metal-fabricating firm is typical. R & M 2-ton and 3-ton Hoists—the latter mounted on an R & M Crane, illustrated at the left—have proved so satisfactory that two additional units are to be delivered soon, to help lift production to still further heights.

Production men specify these husky R & M material-handlers for many reasons. Ranging in capacity from 1000 to 15,000 lbs., they're precision-built from track to hook; they're powered by famous R & M motors; they're equipped with an oversize oil-cooled automatic load brake for safe, efficient service—with minimum maintenance.

Whatever *your* hoisting problem, "take it up" with R & M! Our expert representative will help you find the solution. Call the nearest R & M sales and service office, or write us at the factory.

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Cleveland..470 Rockefeller Bldg.
Denver.....1420 16th St.
Detroit.....2921 E. Grand Blvd.
Houston..3715 Harrisburg Blvd.
Jacksonville....305 Bisbee Bldg.
Meriden, Conn....135 Colony St.
Newark.....700 Bergen St.
New York.....200 Varick St.
Philadelphia.....401 N. Broad St.
Pittsburgh.....H. W. Oliver Bldg.
Providence.....44 Clifford St.
San Francisco, 116 New Mtgmry. St.
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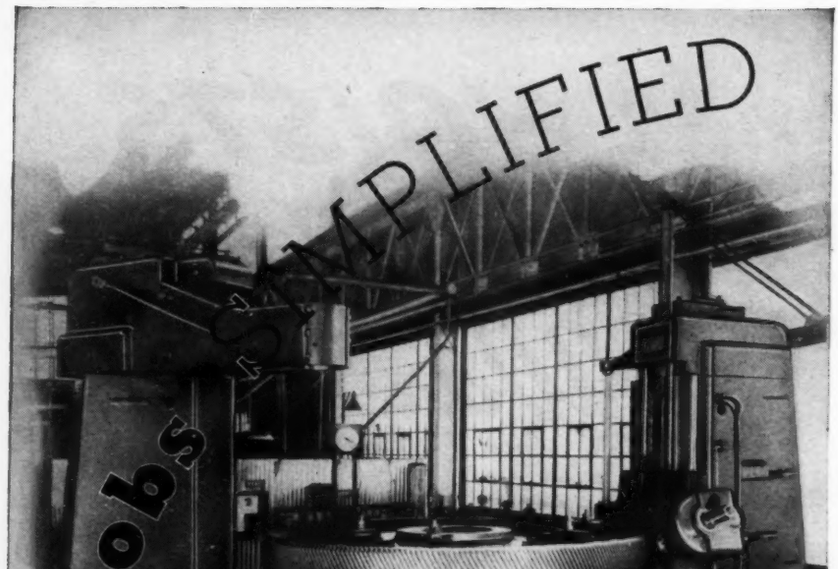
ROBBINS & MYERS • INC.

HOIST & CRANE DIVISION, SPRINGFIELD, OHIO • In Canada: Robbins & Myers Co. of Canada, Ltd., Brantford, Ont.

★ ★ ★ MOTORS • MACHINE DRIVES • FANS • MOYNO PUMPS • FOUNDED 1878 ★ ★ ★



● Mechanical giants which otherwise would demand an operator's continuous attention to oiling—or have their life-span severely cut—are made self-oiling by machine manufacturers' foresight. With BIJUR-equipped machines there are fewer shut-downs . . . less "time out" for repairs and maintenance.

Peak-load production is insured!

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AUTOMATICALLY *Correct* LUBRICATION

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under which he was to employ union members only and the wages they were to be paid. The cards were not uniform and one employer might be required to live up to conditions much more restrictive than another. Any employer not observing the rules on the card was promptly closed down by a strike, while the other restaurants were permitted to operate. By the simple expedient of imposing exorbitant terms upon an employer, it was possible for the union to drive anyone out of business.

When the restaurant operators likewise became unionized, they went to Almon Roth's office with their problem. The Council devised a simple and effective means of ending the vicious practice.

How It Worked

One day all restaurant employees were informed that effective immediately their wages would be cut 25 percent. Just as expected, the union promptly called a strike in an effort to shut down all restaurants, and established picket lines at every cafe. But the employers and their families rolled up their sleeves, went into the kitchens, cooked the meals, and waited on their customers as usual. Outside, the union's pickets were astounded to see picket lines established beside their own by the employers' union. Citizens of San Francisco were urged through every possible medium to patronize the restaurants. Business groups made it a point to hold luncheon meetings in them. An intensive campaign was launched on all sides to build up patronage and keep the restaurants open. To those operators who lost money because of the strike, benefits were paid fully compensating them for their financial losses. Although service was somewhat curtailed, business went on, and some restaurants reported better business than they had ever enjoyed before.

Easy Terms

Finally the union came to the Council and asked on what terms the dispute could be settled. The terms were lenient. All the employers asked was that the union sit down with them and negotiate a master contract establishing the same wages and working conditions in all the city's restaurants, so that all operators would be on equal terms as far as labor costs were concerned. In short, the employers demanded that the union cease its dictatorial practice of arbitrarily setting the wages and working conditions without giving the operator equal voice. After some early stubbornness, the union finally agreed to negotiate such a contract. Of course, the 25

TOUGH TO TAMPER

. . . with Bus Duct

Out of the reach of meddlers and careless workmen—well protected against sabotage—are the Bus Duct lines that distribute light and power in thoroughly modern plants.

Current-carrying bus bars are enclosed *on all four sides* by a strong, rigid casing. Even the "plug-in" openings are capped when not in use.

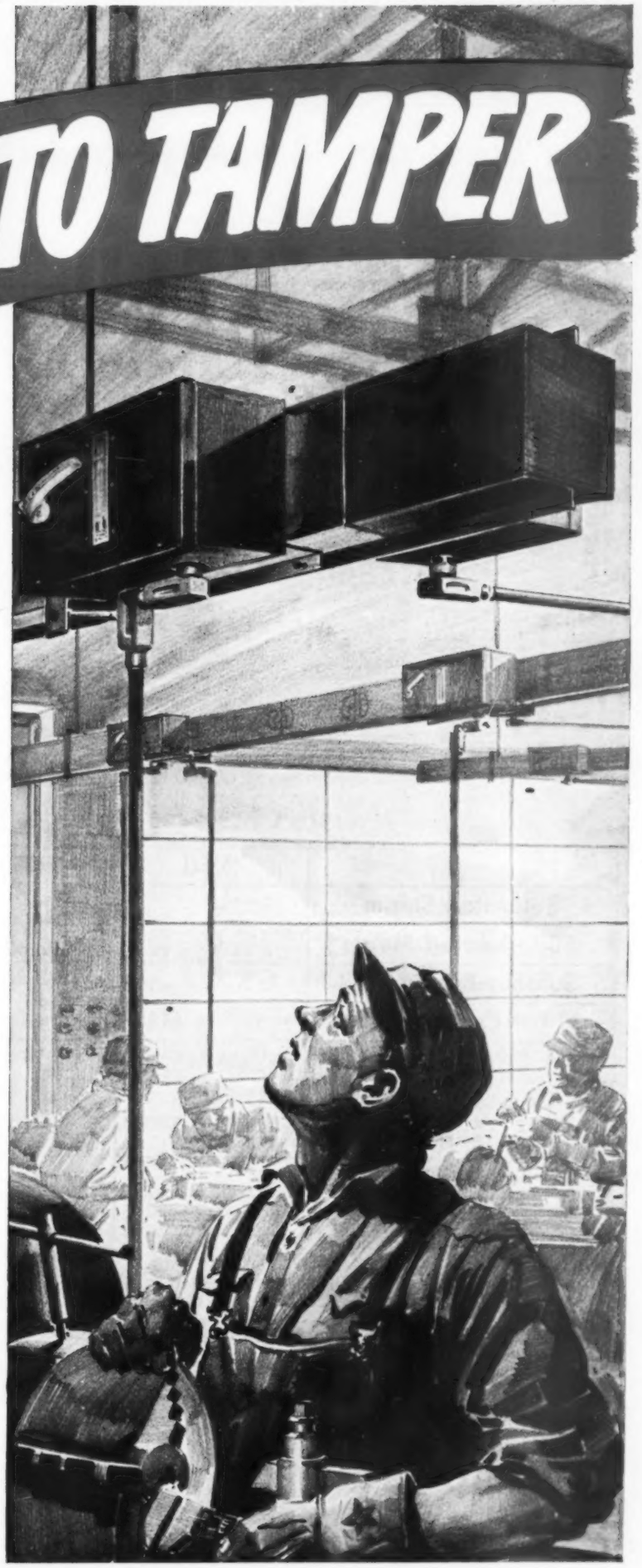
Here is *maximum* protection of property and human life — with *minimum* use of critical materials, consistent with sound engineering.

Even more important, however, are the contributions Bus Duct is making to *production continuity* in the war emergency. Machines can be moved, tool set-ups changed, new circuits added—without cutting power or interrupting work.

"Plug-in" Bus Duct systems are today recognized as an integral part of the machine tools they serve.

In thousands of plants today, they are speeding war-time output. They will be a mass production *necessity* in post-war manufacture.

BUY MORE WAR BONDS • SALVAGE ALL SCRAP METAL



BULLDOG
ELECTRIC PRODUCTS CO.
Detroit, Michigan

BullDog Electric Products of Canada, Ltd., Toronto, Ontario

Field Engineering Offices in All Principal Cities

MANUFACTURERS OF Vacu-Break Safety Switches, SaffoFuse Panelboards, Circuit Master Breakers, Switchboards, Bus Duct Systems — FOR LIGHT AND POWER.

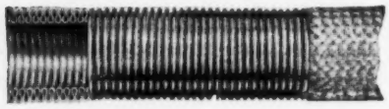
FLEXPEDITE

Your Conversion—Assembly—Production with

REX-WELD

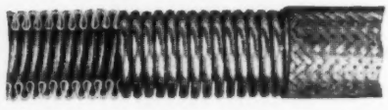
Flexible Metal Hose

Rex-Weld Hose—Annular Corrugations



RW-80 Unbraided ——— RW-81 Braided

Rex-Weld Hose—Helical Corrugations



RW-90 Unbraided ——— RW-91 Braided

General Data

	STEEL	BRONZE
Sizes	To 4" I.D.	To 4" I.D.
Pressures	To 14,500 p.s.i.	To 14,500 p.s.i.
Temperatures	To 1000° F	To 450° F.
Lengths	To 50′	To 50′

Use Chart

	*STEEL	BRONZE
Saturated Steam		✓
Superheated Steam	✓	
Sulphur Bearing Oil	✓	
Oxygen		✓
Ammonia	✓	
Carbon Dioxide	✓	
Sulphur Bearing Grease	✓	
Critical Vibration		✓
Non-Sparking		✓

Protective Coatings Can Be Applied for Corrosion Protection (To Conserve Critical Copper Bearing Alloys).

Couplings: REX-TITE Mechanical (Re-attachable) Couplings; Solder Couplings; Brazed and Welded Couplings and Flange Assemblies for Rex-Weld Flexible Metal Hose.

Ask for Engineering Recommendations

CHICAGO METAL HOSE CORPORATION

General Offices: MAYWOOD, ILLINOIS

Factories: Maywood and Elgin, Ill.

percent pay cut was restored without discrimination to all employees. The strike was over, but collective bargaining had taken the place of collective coercion.

What was done in San Francisco however, required money, and fe employer groups are properly an amply supported by their membe In one good-sized city, the employer association is supported by an annu budget totaling less than local AF unions alone collect in one month Businessmen have not learned how t support and stand by their organiza tions the way employees stand b theirs. Then, too, employers' associa tions do not have the privilege o coercing their members or compelling them to join by use of a closed shop contract the way labor unions do.

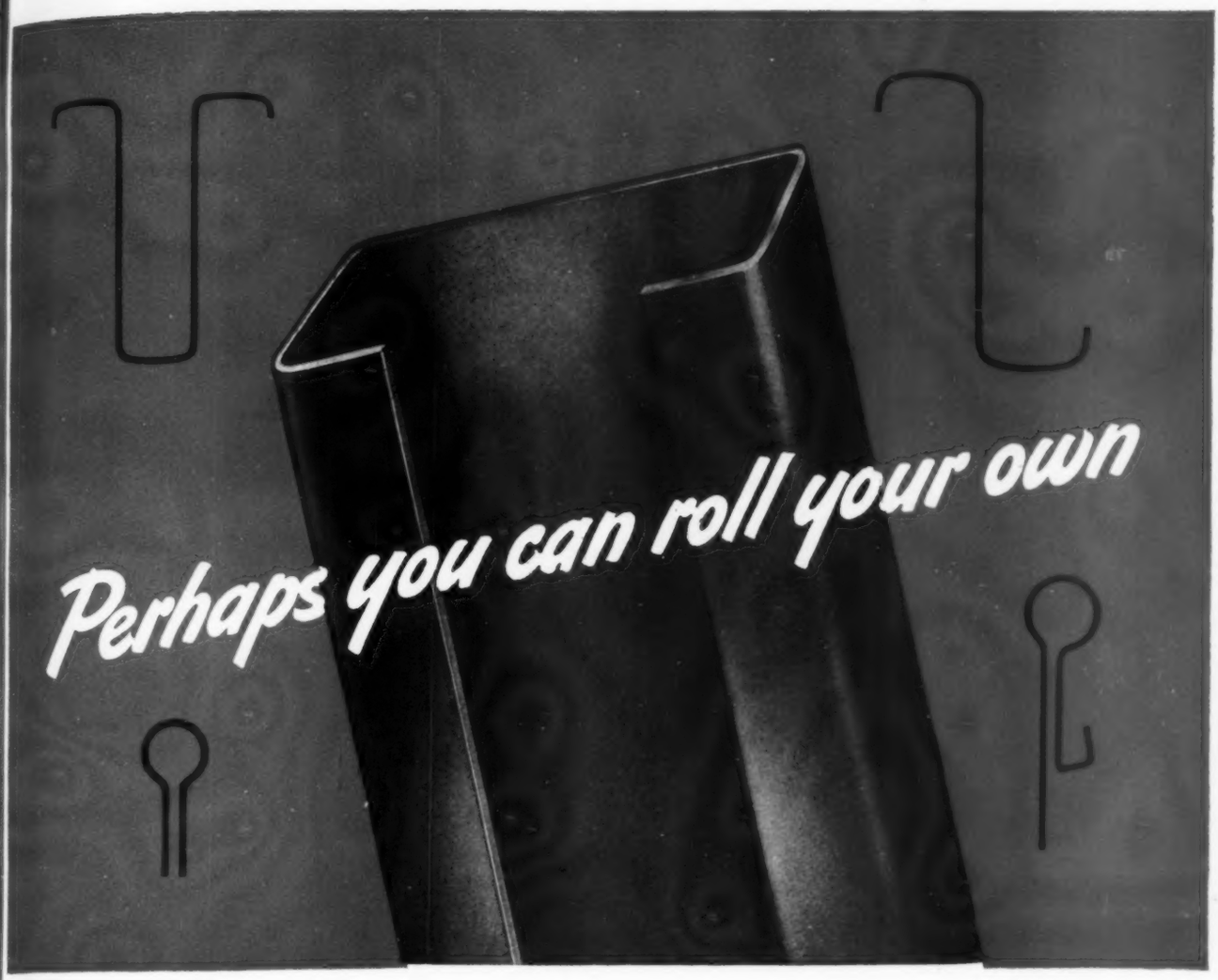
Rate of Return

Too few employers, however, rea ize the rate of interest they actuall receive on their investment in the association. A plant employing 50 workers who are union members is a source of $500 monthly revenue to the union, if the dues are as low as $ per month, which they seldom are But the employer in that plant would feel that he was making an all too generous contribution if he parted with as much as $500 toward the sup port of his employers' association fo an entire year. Yet if all employer would contribute in somewhat the same proportion, the financial diffi culties of many employer organiza tions would be greatly alleviated.

The skilled guidance of an em ployers' association in the negotiation of agreements, its thorough working knowledge of all labor laws, or its abil ity to settle grievances on an equitable basis has frequently saved an employer many times the amount of his annual subscription.

Growing Rapidly

Despite their problems and shortcomings, these local "boss unions" are still very much alive, and are growing rapidly year by year. They perform the most concrete and practical serv ice available to employers anywhere It is plain that the hand of employers in collective bargaining would be greatly strengthened if these local groups could be federated in a nation wide management union. True, the policies of all these local organizations may not be exactly alike, but they are all working toward the same goal— the protection of the public and the employer in labor disputes. Local autonomy could doubtless be pre served as it is with local labor unions The federation could deal with both craft and industrial unions and would be flexible enough to include and



This shape is rolled from Alcoa Aluminum Alloy sheet in a single operation. Its use may take the place of a thicker extruded shape, thereby releasing metal and extrusion presses for production of vital war materials. Its producer is one of many companies who are roll-forming similar aluminum-sheet shapes.

Many of these rolled-sheet shapes, being produced today for war products, are made of heat-treated aluminum alloys to give them high strength. Often, the "as-rolled temper" strip is fed right from the heat-treating furnace to the forming rolls, before the metal can age-harden, thus avoiding distortion that might occur if heat treatment followed forming.

Also shown above, in silhouette, are other rolled-sheet shapes. It doesn't take much stretching of the imagination to visualize a great variety of these aluminum shapes used in numerous products. Exactly the right thickness and shape for strength and stiffness, but no more metal than is actually needed.

The economies possible with large quantity production are certain to cause these aluminum rolled-sheet shapes to be adopted widely for all kinds of postwar applications. ALUMINUM COMPANY OF AMERICA, 2126 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALUMINUM

TAKE A TIP ON

DUST CONTROL

• "Pardon, sir, just look at the dust coming out of your plant. If I'm not too forward, sir, I've been reading about Dust Control in some of your magazines. They say PANGBORN does an excellent job, sir."

• Follow that tip, mister, because Pangborn *does an excellent dust control job!* For more than thirty years both large and small industries have ended their dust problems by using Pangborn all steel, cloth screen Dust Collectors.

• If you want your dust trapped at its source and deposited in hoppers ready for final disposal, if you wish to salvage valuable raw products now being lost in the atmosphere as dust, or if you want to improve working conditions for your employees—COME TO PANGBORN! This tip is worth acting upon at once. Write or wire.

PANGBORN

WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

PANGBORN CORPORATION • HAGERSTOWN, MD.

represent any and every industry which now bargains with organized labor. Employers' organizations could be chartered in cities which today have no organized management group. Confusion which exists in some communities (notably Detroit) because of the existence of many employers' organizations could be ended by chartering a single employers' union as a "local" of the federation.

Labor's Protests

The protests of organized labor that such an organization would undermine and destroy the rights of labor are probably already rising. But the British people will tell you that employer organization does not destroy organized labor. Employer organization in Great Britain stabilized labor relations, adjusted labor disputes peacefully and equitably, and kept organized labor on its toes so that it didn't degenerate into a radical, racketeering parasite on the community. Of course labor unions will oppose an employers' federation. But when they do, they will place themselves in the position of denying the right of collective bargaining to employers while insisting on preserving that right for the laboring man. Their opposition will stem from their own knowledge, based upon years of experience, that in unity lies strength, and he who stands alone against powerful opposition must eventually fall. Labor unions know better than anyone else that their heyday would be ended by employer organization. For the first time in their lives they might be required to carry responsibility commensurate with their power.

One businessman to whom this employer federation suggestion was made, asked what would become of the present national trade associations which are already negotiating agreements for all the employers in their respective industries, such as the organization of over-the-road truck operators. The answer is that nothing need "become" of them. They are already doing the job that needs to be done. The federation of local employer unions would be wise to invite participation of the industry-wide employer groups. The more employers represented in the federation, the better. And, if a group of employers choose to negotiate through their own trade association, there is no reason why they should be prevented from doing so. There need be no CIO vs. AFL in employer unionism. The type of organization that best meets the requirements of the employers involved in negotiations is a minor question which can be met later. It is the organization now that counts—not the type.

"And why," some may ask, "does

PHOTO BY U.S. ARMY SIGNAL CORPS

OSTUCO Seamless Tubing rough-rides with the motorcycle corps

THEY'LL have a big hand in speeding the date for Victory and Peace, these motorcycle troops, although there's still plenty of tough terrain ahead of them. But they'll take that terrain in stride, because their machines, thanks to careful engineering, are built to take it!

In many combat motorcycles, responsibility for necessary structural strength is delegated to OSTUCO at more than a dozen points . . . frame and cross tubes, spark plug wire tube, piston pins, cross tube sleeves, seat post, exhaust tube, fork tubes, tail pipe assembly, heater tubes and other vital parts. OSTUCO seamless tubing supplied for these purposes meets strict U. S. military standards. It fulfills requirements for close tolerances, ductility and machinability.

OSTUCO experience gained from manufacture of seamless tubing for this and many new wartime applications promises competitive advantages to its customers for realization of their peacetime production plans.

● PUT ALL YOUR SCRAP INTO THE FIGHT ● BUY U. S. WAR BONDS

THE OHIO SEAMLESS TUBE COMPANY SHELBY OSTUCO OHIO

RE-LIGHTING

the new manpower / production requirement

Vital to plants built and lighted for daylight operation

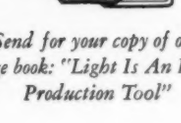
Most plants operating today were designed and built for peacetime, *daylight* working schedules. Wartime production demands night work. *Lighting based on daylight conditions is inadequate to serve the needs of night workers.*

Night production is generally acknowledged to be anywhere from 20% to 40% less efficient than daytime production. And poor lighting, with its consequent eyestrain, fatigue, and lower working efficiency, is a major cause of this slump.

Re-lighting for 24-hour-a-day war production is the easiest, most economical remedy for this condition. Re-lighting does not mean discarding your present lighting system. It merely means bringing the equipment you have up to date by relocating lamps to eliminate glare and shadow; increasing lamp wattages, re-spacing lamps, installing additional equipment to insure uniform lighting levels throughout your plant. A Silv-A-King lighting engineer can tell you exactly.

Silv-A-King has specialized on industrial lighting for 21 years. Silv-A-King quality equipment (fluorescent or incandescent) plus a Silv-A-King "engineered layout" makes an unbeatable combination.

BRIGHT LIGHT REFLECTOR COMPANY, INC.
1027 Metropolitan Avenue, Brooklyn, N. Y.



Send for your copy of our 16-page book: "Light Is An Essential Production Tool"

SILV-A-KING MAKES *Light* WORK FOR YOU

anyone have the temerity to sugge such radical changes in the labor rel tions practices of the nation in tim of war?" The reason is that, und the pressure of wartime conditions, great many weaknesses in the soci and economic structure are brought light. Many changes far more radic than this have already been mad both voluntarily and under gover ment compulsion. No one needs be told how costly work stoppages a in wartime. If, by sensible, progre sive employer organization, labor rel tions difficulties can be smoothed o more quickly and equitably, the ci zens and our government will m certainly endorse the change. For e ample, employer organization shou help ease the burden on the W Labor Board. During 1942 the lat was called upon to review at le three disputes involving automob manufacturers. The review of on one case involving the automobile in dustry is all that should be necessar The board itself attempted to impo a semblance of industry-wide bargai ing upon the steel industry when i asked 41 of the nation's principal st firms to show cause why they shou not comply with the decision of t board in case of the Carnegie-Illin Steel Company (the so-called "l steel" case). Call employer organi tion what you will. It won't hurt t war effort, and it probably will strea line it.

In these days, when organized lab is making rapid strides toward eve goal it has ever set for itself, it b hooves employers to act quickly. The should build their organizations int a constructive, vigorous, strong Amer can Federation of Employers. Then and not until then, will the public, th employer, and the unorganized labore be spared the monopolistic evils whic today mar collective bargaining pro cedure so that it appears very muc like collective coercion.

Which will it be—organization an action leading up the road to soun labor relations; or disorganization an inaction leading down the road t labor dictatorship? Which will it be?

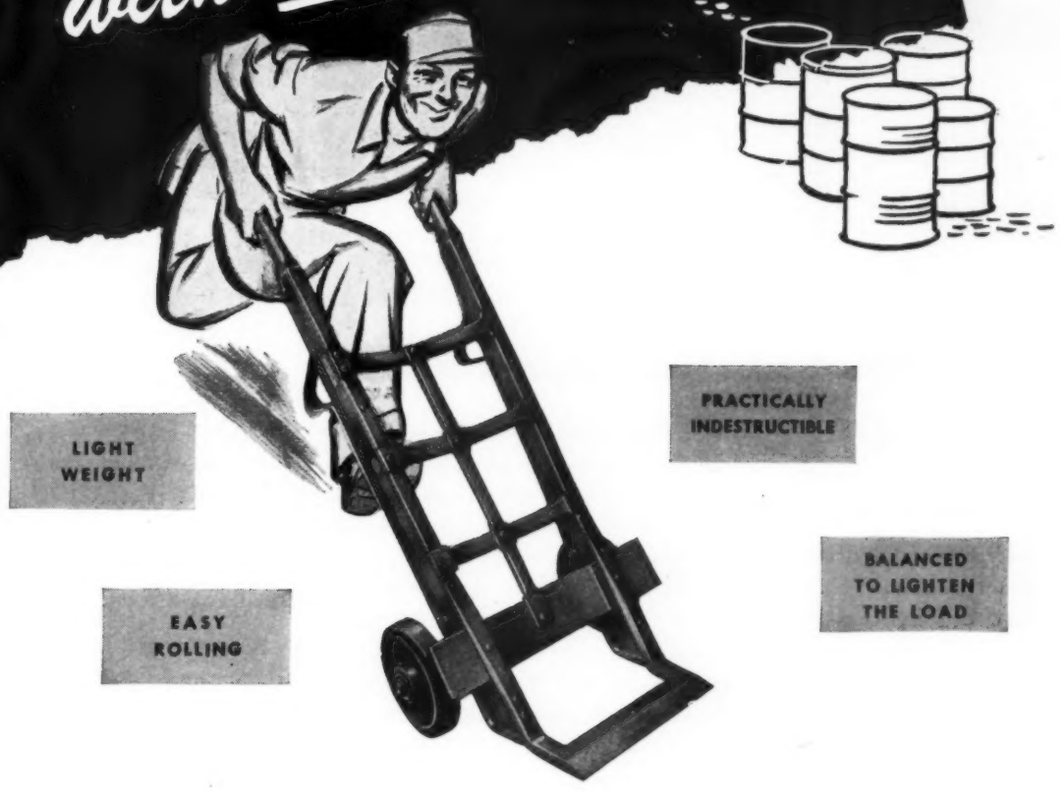
We Like Women in Our Shop

(*Continued from page 94*)

been raised against the use of women in manufacturing operations. This i what we think about the "disadvan tages" in employing women:

1. "*Women are absent more fre quently than men.*" A recent Allison

Move More Tonnage with less fatigue!



Long hours and shortage of manpower call for ways to reduce fatigue—especially where materials must be handled. American two wheel hand trucks lighten the load—and speed up your truckers. These familiar red, pressed steel trucks are accurately balanced to relieve dead weight. Easy rolling under heavy loads is assured by Alemite lubrication, accurately machined wheels, and anti-friction bearings. Practically indestructible, Americans are always *on the job* everywhere—war plants, transportation lines, warehouses, and throughout the world with our country's armed forces.

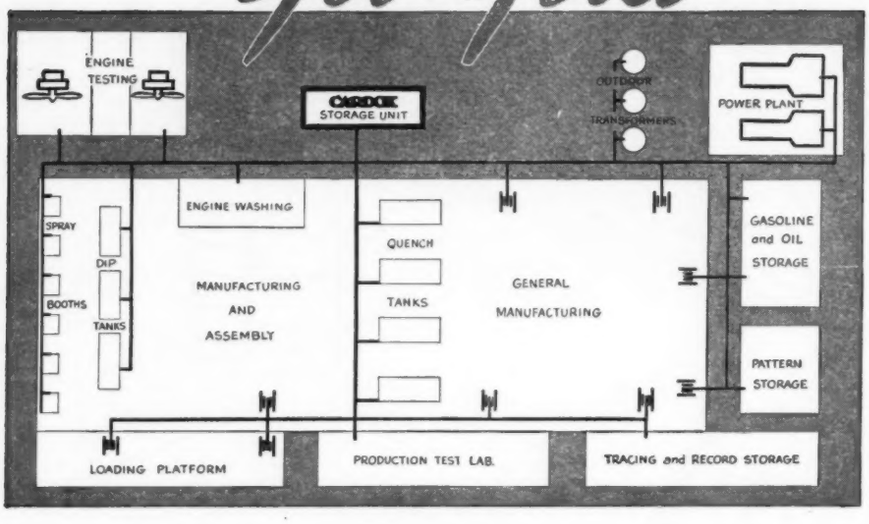
For information on the 39 types of American hand trucks—write for Catalog T-42.

The American Pulley Company
PHILADELPHIA, PENNSYLVANIA

NAVY "E" FOR EXCELLENCE
AWARDED FEBRUARY 12, 1942

AMERICAN
PRESSED-STEEL
HAND TRUCKS

PREVENTIVE ENGINEERING *for fires*



An important message to executives who buy engineering—for both present and future plans

The composite, schematic drawing shown here illustrates how Cardox Fire Extinguishing Systems and Cardox *preventive engineering* combine to stop fires *before* fire can stop production or cause extensive damage.

You will notice that the hazards are unusual, both in number and diversity. In such cases *preventive engineering* provides an entirely practical solution—determining *in advance* and drawing right into the Cardox *blueprints* individual hazard requirements for over-all fire protection.

Cardox in Your Plant

What this means to you is this: With a Cardox System you can protect many hazards in your plant with an application specifically *engineered* to the fire conditions involved, and all part of one complete system.

Further, you obtain the proved, practical advantages of Cardox Systems' enhanced fire extinguishing performance. Outstanding among them is the amazingly quick Cardox extinguishment of fires by *mass* discharge (in tons, if needed) of Cardox CO_2, supplied from a *single* Storage Unit that stores from 750 pounds to 125 tons of liquid carbon dioxide at controlled low temperature.

Your War-Time Status

War naturally restricts Cardox Corporation to the engineering of Cardox Systems to meet the most vital needs. Whether or not your need qualifies you, make Cardox progressive developments a part of your fire protection planning—present and future. Write, on company letterhead, for Bulletin 1123.

CARDOX CORPORATION • Bell Building, Chicago, Illinois

District Offices in: New York • Washington • Detroit • Cleveland • Atlanta • Pittsburgh San Francisco • Los Angeles • Seattle

survey showed the attendance record of male and female employees to be practically the same, a slight advantage actually being on the side of the women employees.

2. *"Apt to break company rules."* In direct contradiction, we have found that our women are generally much more conscientious than the men in observing company rules and regulations. Most violations have been due to ignorance of a rule rather than to a flagrant desire to violate it.

3. *"More emotional when reprimanded."* We agree that, to some extent, this is true. But it is not necessarily an undesirable trait, and is easily remedied by a little more tact and diplomacy on the part of the supervisor. We accept the fact as confirmation that women are generally more conscientious about their work than men.

4. *"Rebellious about wearing unattractive protective clothing."* We have found, with proper education on safety practices and the need for protective apparel, very few women are rebellious about wearing protective clothing. In the few cases where women have objected, usually the ones involved were more interested in attracting the attention of male employees than in doing their job. A girl of this type is naturally a liability, and fortunately is in the minority.

5. *"Not physically equipped for 'heavy' jobs."* Why should there be any heavy work in a plant for men or women? Allison has recognized this problem, and we are taking the necessary steps to eliminate *all* heavy work, for men as well as for women. The cost of handling equipment so that heavy parts can be slid into place rather than lifted should not be excessive, but should result in an overall increase in efficiency. If all jobs are laid out with women's physical limitations in mind, the fact that they are not able to handle heavy work should not be a handicap.

6. *"Disinclined to be moved from one job to another."* Most of our women workers have been so eager to learn that they have welcomed the opportunity to be moved to other jobs. We recently transferred five girls from receiving inspection to teardown inspection, an entirely different type of work. Although these five girls were among the oldest in point of seniority, they were very eager to move to another job. They welcomed the opportunity to learn the new work. This seems to be typical of the attitude of most of our women employees.

7. *"Inclined to fear injury and disfigurement."* Everyone fears injury and

Will Your "FORTRESS" Be Ready On Time?

Think of the months of training and practice this bomber crew put in before they were ready for the real test.

ALTER EGO: And, think of the *years* of effort engineers and shop men put into the development of the "Flying Fortress" . . . all to enable the crew to rule the airways—to navigate in a bee-line to the destination, fight off "competition" all the way, hit the target and get home safely.

Like the YEARS of preparation that'll be required to develop fortresses of knowledge before business crews can expect to rule the post-war market ways.

ALTER EGO: Right! It'll take shrewd management to steer a course of profits . . . ingenious designing to fight off tough competition . . . efficient production to hit the mark of rock-bottom costs and top quality. All of this *to survive.*

All of which is embodied in the practiced use of arc welding. There's our fortress for survival in the Battle for Business. Let's start developing our welding knowledge NOW by consulting Lincoln.

Ask your inner self if time isn't getting short for post-war planning

THE LINCOLN ELECTRIC COMPANY
CLEVELAND, OHIO

then I said to myself—

WELDED PRODUCTS HIT THE TARGET

OFFICIAL PHOTO U. S. ARMY AIR FORCES

This floor will increase production!

We'll prove this by installing 100 feet FREE in your plant

Almost every plant floor slows production. Check yours. Do workers tire on their feet? Do men or trucks slip frequently? Does the floor raise dust that harms men and machines? Double-Tough Kentile eliminates all this — never dusts, isn't slippery even when wet, is comfortable because it is resilient. We'll PROVE these facts, plus—(1) Double-Tough Kentile is smooth and firm for trucking, yet provides traction even on ramps — (2) it is amazingly durable; won't crack or chip; is practically proof against abrasive wear, trucking indentation—(3) won't spark —(4) has no glare. Furthermore, simple mop cleaning maintains it, it is so damp-proof you can even lay it on concrete right on earth, it is laid tile by tile so separate pieces can always be changed, installation is so speedy production need never be halted, cost is the lowest known, no priorities are required.

Does the above sound fantastic? Send for our Technical Data on Double-Tough Kentile—and see why we're willing to make the "all out" offer to the left. There are no strings, no obligations. You can't lose, you'll learn something new—and you *can* improve your plant, NOW!

FREE TEST OFFER

We'll install up to 100 square feet of Double-Tough Kentile in your plant without any cost, condition or obligation upon you in any way.

DAVID E. KENNEDY, Inc.
78 Second Ave., Brooklyn, N. Y.

Without obligating me any way please send informative data advertised and have representative see me about the FREE test offer made in Factory, Feb., 1943.

NAME_____

FIRM_____

ADDRESS_____

CITY_____ STATE_____

disfigurement to some extent. Possibly women do give it more thought than men. Yet, is this a handicap? Doesn't it make each employee more receptive to safety instruction, more anxious to observe safety practices, and use recommended protective equipment and wearing apparel? This attitude on the part of new women employees is, therefore, in our opinion, an asset rather than a liability.

8. *"Often wrapped up in their homes and children."* As far as Allison is concerned this is a very desirable trait for both men and women. Especially in wartime, this is the motivating force behind everything we do. Because of our desire to protect our homes and children we are all urged toward greater accomplishment in the performance of our duties. We feel that a woman who is wrapped up in her home and children is a far more desirable employee than one who is primarily interested in personal gain.

This is our reaction to women in the shop. The reaction of our male employees has been pretty gratifying, too. There have been few cases of resentment at having women doing "man's work." Most of the Allison men are willing to admit that, given the proper training, women can do the job as well as and sometimes better than men.

We have seen what women can do and are more than pleased with the results. Within the next year we shall probably hire several thousand more. We are confident that our present standards of quality and quantity production will be maintained.

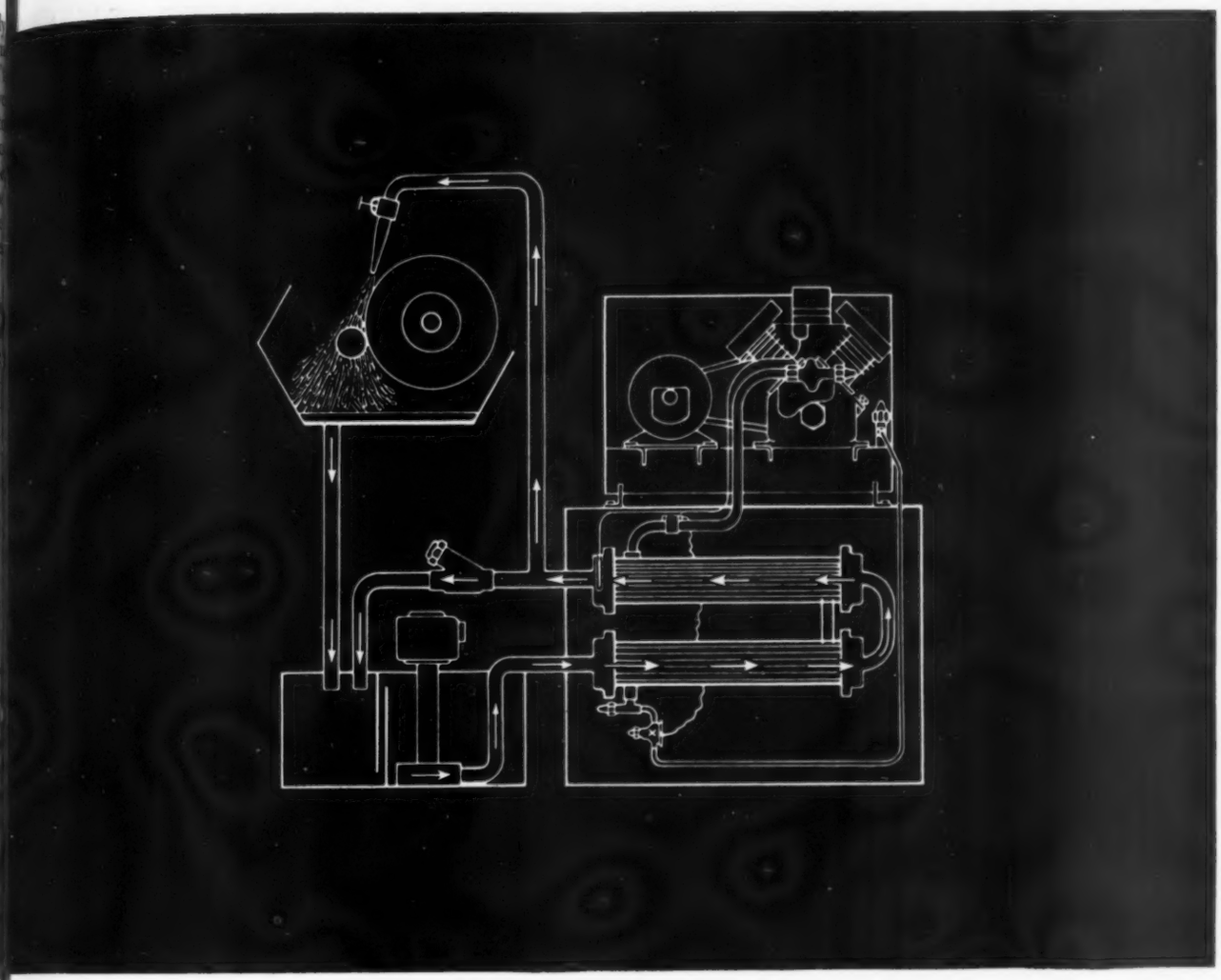
Significant Labor Developments

(Continued from page 96)

excess of 15 percent since January 1, 1941.

WLB Grants Increases to Prevent Labor Piracy

Where WLB granted increases to bar labor piracy, it was influenced by the following factors: (1) Labor turnover in one plant of about 100 percent during the past year, reducing the plant's labor force by one-half (Precision Parts Company); (2) potential peril to production of nickel and chrome castings, done almost exclusively by the second plant, unless the plant's employees were granted a wage increase (Standard Alloy Company); and (3) the high rate of turnover in the third plant evidencing existing



Are Cutting-oil Temperatures Your Bottleneck?

IF SO, BREAK IT WITH THE F-M INDUSTRIAL FLUID COOLER

Where tolerances are measured in tens of thousandths of an inch, *controlled coolant temperatures* are necessary to break the bottleneck of lost time, wasted material, and frequent repairs to equipment.

A close fit between a 2-inch steel shaft finished at 120° and a bronze bearing finished at 70° cannot be made, because accurate size specifications of any metal object are subject to the *temperature at which the dimensions are measured.*

To provide industry with a simple, accurate, and *economical* means of controlling and maintaining lowered temperatures of coolants, Fairbanks-Morse developed the F-M *Industrial Fluid Cooler.* It is a "package unit"—complete, compact, ready and easy to install. It can be used to *control the temperature of cutting oil; to cool hydraulic oils; to maintain constant temperature of quenching baths; to control temperature in laboratory testing;* and in condensing and dehydrating operations.

Other benefits of the F-M Industrial Cooler are: tools remain cool while working; there is no need to stop to allow heat to be dissipated; resharpening and replacements are needed less often; damage from overheating is held to a minimum.

Consult your resident F-M engineer for complete and exact information as to how the F-M Industrial Fluid Cooler can speed up machining operations and provide extremely accurate control of precision work in your plant.

To meet him, write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill. Branches with service stations throughout the United States and Canada.

Consult us on all Industrial Cooling and Heating problems

FAIRBANKS MORSE

Air Conditioning and Refrigeration Equipment

Cannon Connectors—or Plugs—are used to connect electrical circuits, just as you use sockets and plugs to connect floor lamps, electric irons and other appliances in your home.

The main difference is that Cannon Plugs are made for use on aircraft, in radio stations, motion picture studios, and many other places where very complicated arrangements of wires must be connected or disconnected easily and quickly, and where the connection once made must never fail.

Cannon Plugs are made so that the outside protecting shell can accommodate a very wide variety of contact pins or sockets on the inside. The parts are widely interchangeable.

The variations available in Cannon fittings are almost without limit. They are adaptable to scores of military and peace-time applications.

CANNON ELECTRIC

Cannon Electric Development Company. Los Angeles, California

Canadian Factory and Engineering Office: Cannon Electric Co., Ltd., Toronto, Canada

REPRESENTATIVES IN PRINCIPAL CITIES—CONSULT YOUR LOCAL TELEPHONE BOOK

inequalities between wage rates in the plant and those paid in other plants in the area. (Micamold Radio Corporation.)

Increase Granted in Violation of Little Steel Formula

Even though WLB has announced as its policy that it would not grant an increase merely to check labor piracy it has granted an increase even in violation of its 15 percent rule, where the rates already in force were substantially below rates for comparable work in the area. (Precision Parts Company.)

Less Than 15 Percent Increase Granted

WLB awarded less than a 15 percent wage increase on the ground that living costs in the local area had not advanced 15 percent; present rates compare favorably with those paid in comparable situations. (Diamond State Telephone Company.)

WLB Orders Check-Off

In an effort to end unrest and the boast by non-union members that they were deriving benefits of the union without the obligation of membership, WLB ordered a check-off of union dues. (Five St. Louis Refractories.)

Check-Off Denied

Where there are few physical difficulties involved in collecting dues, WLB denied the check-off, but directed the company to permit collection of dues if not on company time. (Niles-Bement-Pound Company.)

**WLB Grants Non-Retroactive Back Pay and Union Security*

WLB compromised in a demand for a wage increase by granting back pay not, however, retroactive to the date of the Big Steel case. For the employees' benefit a union shop was retained. (Penn Iron & Steel Company.)

WLB Permits Protest But Not Duress Clause in Contract

WLB will allow a dissatisfied employer to include a protest clause in its contract. It may not, however, claim that the contract was made under duress since, reasoned the Board, such a clause would imply that the employer need not conform, a contract under duress being invalid. (Montgomery Ward & Company.)

Grievance Subject to Arbitration

The settlement of grievances is not the exclusive responsibility of the employer. It is subject to arbitration as a special safeguard of employees' rights and compensation for services ren-

INTO THE AIR . . .

Faster

BECAUSE OF

STANDARD CONVEYORS

BOMBERS and fighters — death-dealing American war birds — get into action faster because Standard Conveyors help to speed production of units and parts in scores of America's aircraft plants.

This is another of many examples of Standard Conveyors' important contributions to high-speed war production.

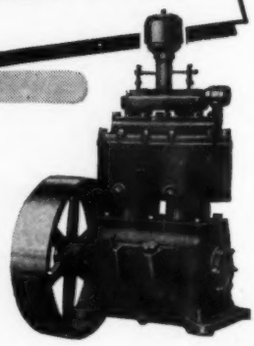
★ ★ ★

If you are producing products considered necessary to the war effort, Standard Conveyors are available to help you speed production. Write for bulletin FM-2 "Conveyors by Standard" — a valuable handbook on conveyors and conveying methods.

Standard Conveyor Company
General Offices:
North St. Paul, Minn.

ENGINEERED FOR FASTER PRODUCTION

How to Extend the Life of Your CURTIS AIR COMPRESSORS



• It will pay you to follow these suggestions on proper servicing of your Curtis Compressor. While long life is an inherent quality of every Curtis product, a little extra maintenance care now will extend its years of usefulness to help carry through today's critical times.

INSTALLATION . . . Be sure your compressor is in a clean, dry location in a level position; mounted solidly on a concrete foundation or bolted to an iron base. If motor driven, see that compressor and motor operate at recommended speed, in proper direction, and that motor specifications agree with current available.

LUBRICATION . . . Maintain proper oil level—check daily—oil only through oil filler cap—follow manufacturer's instructions. Use light grade auto cylinder oil. Drain and refill every three months. Keep oil off of belts.

COOLING WATER . . . Circulate a continuous supply of cooling water through jackets—either by connection to water lines or with water circulating pump. Under full load, cooling water should not exceed 125° F. When pump is used, keep pump suction always flooded.

SERVICING . . . Drain moisture from air tank at least weekly, preferably every day. When replacing head gasket, secure proper grade of material from manufacturer—do not use paper or soft rubber. Keep compressor clean.

TESTING . . . If air supply or pressure decreases, test all outlets, joints, and valves for leaks—using soapy water and brush. Periodically inspect check valves, safety valves, and valves in head of compressor. If they leak, remove and clean—oil them so as to work freely. Keep flywheel tight on shaft with nut and lock washer.

GENERAL . . . Discharge piping should be full size of compressor opening, as short as possible, with minimum number of bends. Don't use steam or water check valves; use dash pot or disc type. We recommend "V" belt drives with take-up provision. Consult instruction book when making repairs or replacements — when ordering parts or repairs, give serial number on nameplate.

By following these few service suggestions, you'll aid your Curtis Air Compressor to operate at peak performance throughout an unusually long, trouble-free life.

CURTIS

Curtis Pneumatic Machinery Division
of Curtis Manufacturing Company
1995 Kienlen Avenue St. Louis, Missouri

dered in settling such disputes is to be paid by the union. (Niles-Bemet-Pond Company.)

**Arbitration Rejected*

WLB refused to entrust to arbitration the issue of promotions and transfers in a high-explosives plant, because of the danger to life should wrong decisions be made. (Atlas Powder Company.)

Maintenance of Membership an Instrument of Control

The policy of WLB is to grant union security unless some definite reason can be shown for denying the union's request—i. e., irresponsibility. In effect, therefore, the Board now uses this clause as a potent instrument for controlling the conduct of labor organizations. (Atlas Powder Company.)

**Union Penalized for Strike*

Though granted a wage increase in conformity with WLB's stabilization formula, a union which had authorized and conducted a strike was denied vacations for the duration and six months thereafter. The Board agreed, however, that if a vacation plan is adopted within the period of a pending contract in conformity with the Board's policy, such vacation period is to be offset by a cut in pay of $1 a week. (Publishers Association of New York City.)

Premium Pay

WLB ruled that salaried employees are to be compensated for work on holidays by a half day's pay extra for each such day worked, not by time and a half. Since the employees were being paid on a monthly basis, reasoned the Board, they were already receiving time as part of their regular salary; hence they were not entitled to an additional amount of half time. (Shell Oil Company.)

**Strike-Lockout Justified*

WLB ruled that a strike or lockout may be justified where one of the parties refuses to abide by an arbitrator's award. (Windsor Manufacturing Company.)

Procedure for Strike Control

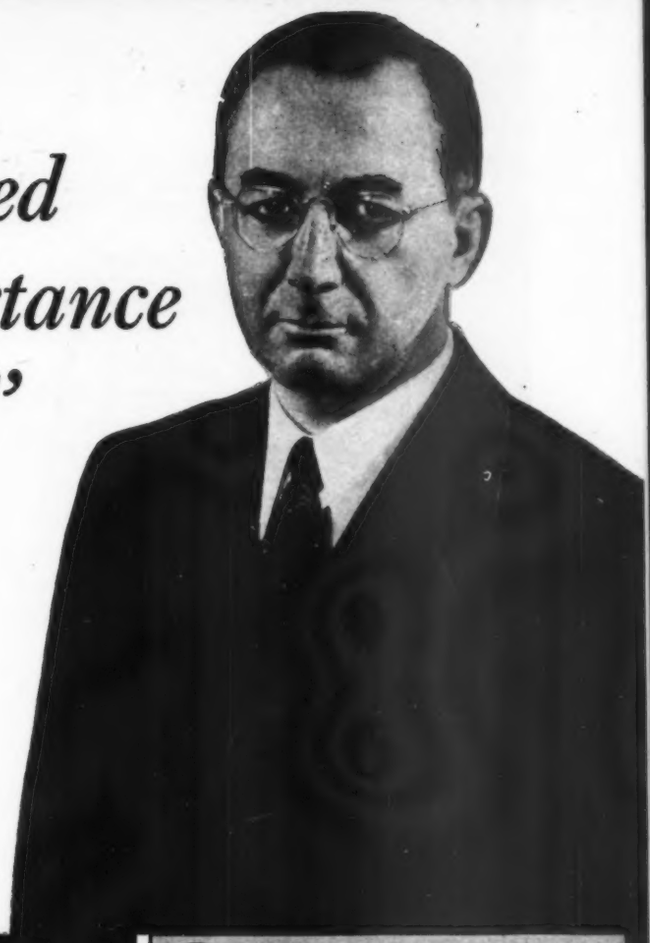
WLB prescribed procedure for eliminating any potential disputes by requiring that the union be notified in writing, within the escape period, that the employee intends to withdraw. (Windsor Manufacturing Company.)

**Self-Imposed Limitation*

The removal of long established substandard wages is not the function of WLB where such wage is in no way

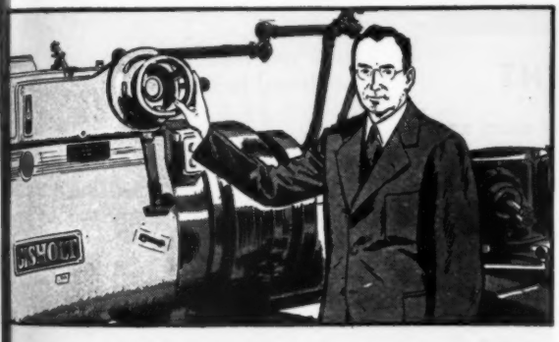
MACHINE TOOL TIPS FROM THE TOP-NOTCHERS—#1

"Correct cutting speed is of the utmost importance in metal turning"



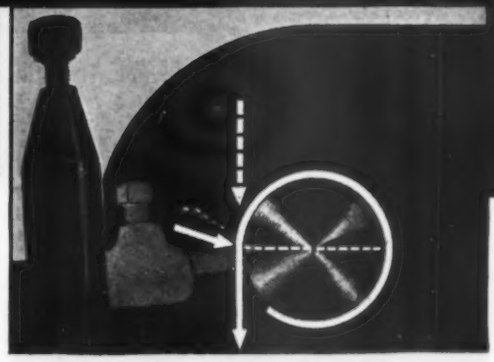
says GEORGE M. CLASS
Vice-President in Charge of Engineering
GISHOLT MACHINE COMPANY
Madison, Wisconsin

Latest Gisholt contribution to the war effort is the new Heavy-Duty Turret Lathe with time-saving Gisholt Speed Selector, which is helping American industry "MAKE IT FIT TO FIGHT."



"SELECTING THE PROPER TOOL to cut a specific kind of material is only part of a cutting operation. For the best results the machine should be operated at correct cutting speed. To select this speed properly, it should be kept in mind that the faster the rate of the cutting speed, the closer you approach the speed at which the cutting tool actually *cuts* the metal and does not just push it off the part being machined.

"TO ACHIEVE the desired clean cut, the tool used should be ground at regular intervals (Fig. 2 above). A good rule to follow is: the cutting speed for roughing tools should be maintained at a rate resulting in approximately a 4-hour tool life between grinds; with a tool life of from 8 to 12 hours between grinds for finishing tools.



"IT IS ALSO TRUE that the faster the cutting speed the better the finish on the work. For at the point of speed where the tool actually cuts the metal, in place of pushing it off, a very smooth finish will be produced. Always run as fast as the tools and the design of the work will permit.

"IT IS ALSO DESIRABLE to use a cutting lubricant that not only will keep the work and tool cool, but also will lubricate the cutting edge of the tool. This allows the chip to slide more freely over the top of the tool, thus producing a better cutting action and allowing an increase in cutting speed."

The correct cutting oil is as important to proper machine tool operation as the correct cutting speed. That's why Shell has developed a control technique that "balances" the oil to the machine, the application and the tool. Call in the Shell man now for details.

SHELL

SHELL LATA OILS
FOR METAL WORKING

THAT THERE SHALL ALWAYS BE LIGHT

On the production front all over the country men are hard at work making guns, planes, ships, and tanks. Tools for Victory. And Federalite NTPR panelboards are hard at work, too, giving perfect control and protection of lighting and small power circuits.

Panelboards alone, like any single factor taken by itself, won't win the war. But anything that helps speed up output and improve quality—anything that helps get the job done better and faster–*helps* win the war. That's just what Federalite NTPR panelboards are doing. These rugged, precision-made Federalite NTPR panelboards are built for service. Steady and dependable, they offer many advantages—switch ahead of every fuse gives higher safety factor . . . floating contacts . . . frictionless snap-action mechanism . . . solderless lugs in mains and branches . . . giant, easy-grip switch handles . . . shallow depth for mounting in thin walls . . . large wiring gutters . . . *low cost.* These are but a few of the reasons why Federalite NTPR panelboards are being installed in greater number today than ever before.

To assure a steady flow of power for lighting and small power circuits . . . to protect the lights by which men work . . . to help keep the wheels of industry rolling . . . that's the job these low cost panelboards do. *For complete information write for catalog 42.*

SAFETY SWITCHES • SWITCHBOARDS
PANELBOARDS • CIRCUIT BREAKERS

Federal

FEDERAL ELECTRIC PRODUCTS COMPANY

58 Paris St., Newark, N. J.

related to the war effort. The Board, in refusing jurisdiction, announced that it would not establish a new wage policy. While it agreed that it was desirable to remove such substandard wages, it concluded that the task is properly the function of the Wage-Hour Administration. (Kuehne Manufacturing Company.)

No Jurisdiction

Jurisdiction of the Board does not extend to disputes between the agencies of states or municipalities and their employees. (City of Newark.)

**WLB Defers to NLRB*

WLB for the present declined to order reinstatement of two employees discharged in accordance with a union shop agrement shortly before the contract expired, and at a time when a rival union had given notice that most employees had transferred their affiliation to the rival union. The Board delayed its decision pending action of the NLRB despite the union's plea that delay in obtaining reinstatement would encourage unrest among the employees. (Corcoran Metal Products.)

NATIONAL LABOR RELATIONS BOARD

**Miniority Picketing Banned*

The Wisconsin Supreme Court sustained the State's Employment Relations Board in banning picketing of an employer by a minority union which coerced employees to picket. Such picketing, even though peaceful, was held not to be protected by the constitutional right of employees to publicize the fact that the employees were not members of the particular union. (Retail Clerks' Union vs. Wisconsin Employment Relations Board.)

**Employer May Refuse to Deal With Minority Union*

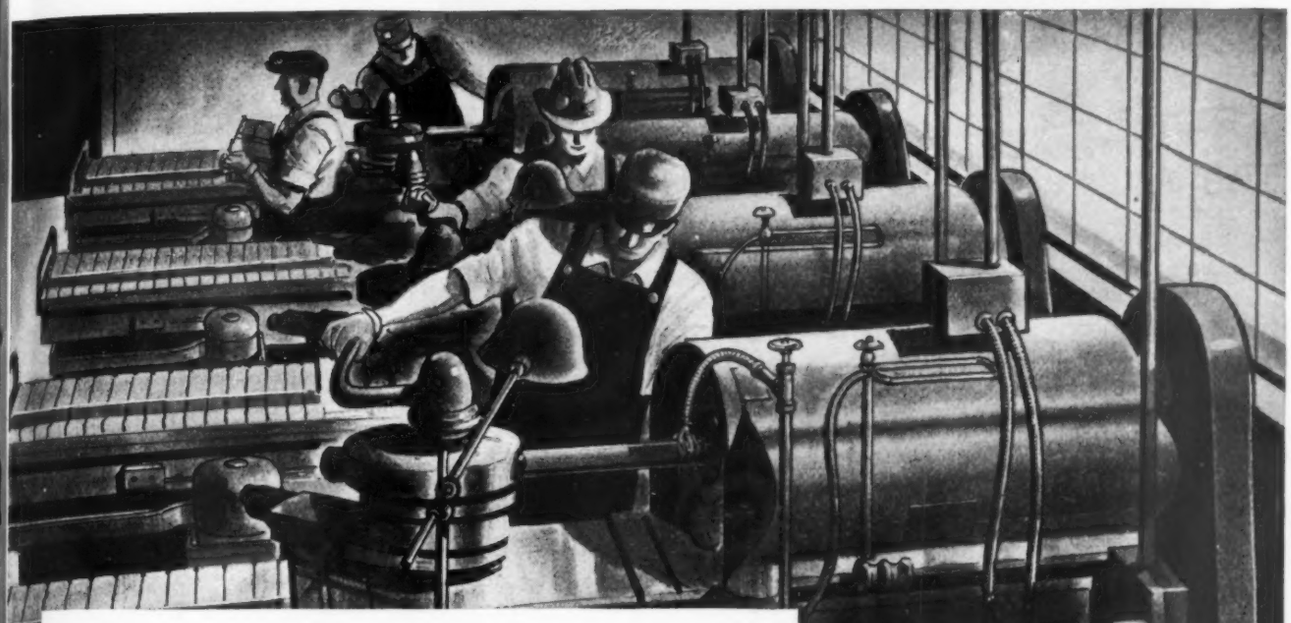
An employer has the right to declare that he will deal with a union as soon as it establishes its majority status, and his refusal to deal with a minority union in settling a strike does not necessarily constitute a violation of the Wagner Act. In fact, even though the employer actually assisted non-strikers to pass the picket line, made individual offers of reinstatement to strikers, and paid a bonus to non-strikers, he was held not guilty of interference with employees. (Charles Bloom.)

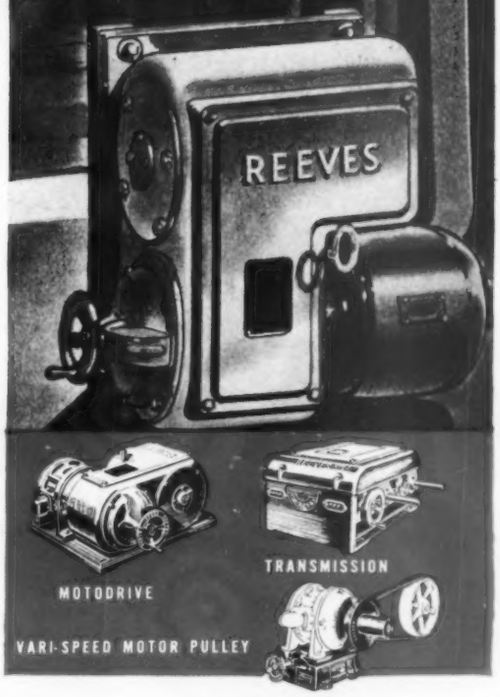
**Restitution of Check-Off*

A Circuit Court of Appeals ordered reimbursement of dues checked off for membership in an employer-dominated organization. In the particular

They made 4 machines do the work of 5

by installing REEVES Variable Speed Drives





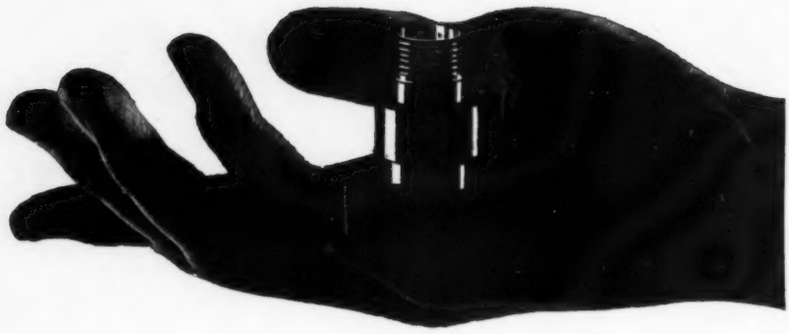
★★★ Twenty-five per cent more output of gun parts, *with no extra machinery, no extra labor and no extra floor space,* is one way to win the battle of production and beat the Axis.

A Detroit machine shop accomplished this increase by installing REEVES Variable Speed Drives on the lathes *they had.* This not only made four machines—*and four operators*—do the work of five, but gave greater precision in machining. These results are not unusual. Productive capacities of men and machines are often doubled with REEVES units, which provide full-range, stepless speed adjustability. Operators can always run REEVES-equipped machines at the *best* speeds for each changing condition.

The faster tempo of the war dictates use to the limit of plants we have *right now*—and REEVES Speed Control, available in many models and sizes, insures increased output and greater accuracy on all types of driven machines *now in service.* Standard on 1,440 different makes of new machines. Booklet FG-423 tells the story. Write for it.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

REEVES *Accurate Variable* SPEED CONTROL



The Answer to a Foreman's Prayer

This is a valve part . . . used in aircraft instruments. The foreman in charge of its production had a fairly happy lot—until nickel hit the "critical" list.

This particular piece was made of alloy steel, rich in nickel. Came a recent day, however, when the specified steel became as scarce as coffee. It looked like production quotas were due to start skidding.

Putting the problem up to Frasse, the foreman substituted, as per recommendation, a more plentiful low-nickel emergency steel—NE 8620. The only wrinkles—slight changes in machining and tempering—were quickly ironed out, leaving hardly a ripple in the production schedule. Trouble hasn't reared its head since.

Frasse technical representatives have been gathering such operating data on the new emergency steels for months. If you are still in the contemplating stage, or have struck a "bug" in changing over, Frasse engineers will be glad to pitch in. Their advice is gratis. Just write or call: *Peter A. Frasse and Co., Inc., Grand Street at Sixth Avenue, New York, N. Y. (Walker 5-2200) • 3911 Wissahickon Avenue, Philadelphia, Pa. (Radcliff 7100-Park 5541) • 50 Exchange Street, Buffalo, N. Y. (Washington 2000) • Jersey City, Hartford, Rochester, Syracuse.*

Frasse
Mechanical and Aircraft STEELS

SEAMLESS MECHANICAL AND AIRCRAFT TUBING • DRILL ROD COLD FINISHED BARS • WELDED STEEL TUBING STAINLESS STEELS AND TUBING • AIRCRAFT STEELS COLD ROLLED STRIP AND SHEETS • ALLOY STEELS

case, although the employees agreed to the check-off, they had to agree in order to secure employment. The restitution of dues was compared by the Court to the granting of back pay to employees who were discharged in violation of the Wagner Act. In both the payment to the employees is ordered to deny to the employer the advantage of an unfair labor practice. (Virginia Electric & Power Company.)

**Domination Evidenced By Employees' Belief*

The mere fact that employees believe that the employer has suggested the formation of an inside union, has been held to be sufficient basis for the Board's finding that the employer was guilty of discrimination, provided that belief is substantiated by supporting circumstances for which the employer is responsible. In the particular case the employer did not even require proof that the union seeking recognition represented a majority of his employees. (Enderlein Iron Foundries.)

Domination by One Employer

Even a one-man employer may be held guilty of dominating his employees where the inside union's constitution subjects the union to the employer's control, or governing rules bar outside affiliation by restricting choice of union representatives to employees of the particular employer. (Elizabeth Arden, Inc.)

Refusal to Bargain

An employer who excluded a union in negotiation on wage adjustments, and denied the union any information regarding the basis on which the wages were increased, was held guilty of refusal to bargain. (Aluminum Ore Company.)

**Employer Must Ascertain Union Status*

The duty of determining whether a union represented a majority of employees and was, therefore, entitled to be the appropriate bargaining agency was on the employer. (Coca Cola Bottling Works.)

**Refusal to Reinstate Justified*

An employer seeking a review by the WLB or some other impartial agency on the issue of whether its conduct was discriminatory may refuse to reinstate a discharged employee without risking a violation of the Wagner Act. (American Linen Service Company; Oregon Shipbuilding Corporation.)

Board Is Sole Administrator of Act

Once a court has confirmed a back pay order issued by the NLRB, the task of administering the order is exclu-

J. L. Dugan (2nd from left) salesman, Southern Tier Electric Supply Co., Inc., Elmira, N. Y., G-E distributor, is helping to select materials for rush war job and to plan their delivery. In the photograph left to right: F. Farley, shipping and receiving clerk; Mr. Dugan; Robert O'Connor, counterman; H. P. "Hank" Brill, manager.

J. L. Vanneman (left), salesman, General Electric Supply Corporation, Denver, Colo., is here discussing circuit breakers and going over building plans with Dudley Elkins, Sr., of The El Paso Electric Co., Colorado Springs, Colo. Mr. Vanneman supplied necessary materials for the job and is supplying maintenance materials.

G. E. White, sales manager, Central Electric Supply Company, Battle Creek, Mich., G-E distributor, among other services, helps local plant engineers and maintenance men to keep their wiring systems in first class condition by supplying materials and helpful service as needed.

T. E. Kuryla (left), salesman, General Electric Supply Corporation, Erie, Pa., is shown in the photograph helping H. W. Alexander, manager of the Surgical Lighting Division of the American Sterilizer Co., Erie to take off wiring devices, wire and conduit fittings needed for new germicidal units. Note unit on desk.

Call the G-E WIRING MATERIALS DISTRIBUTOR *Near You* for War Purpose Wiring Supplies

General Electric Wiring Materials Distributors are located at more than 175 key points in the United States. One of them is near you ready to supply suitable material for war jobs. This distributor wants to cooperate with you in every way possible to aid the war effort.

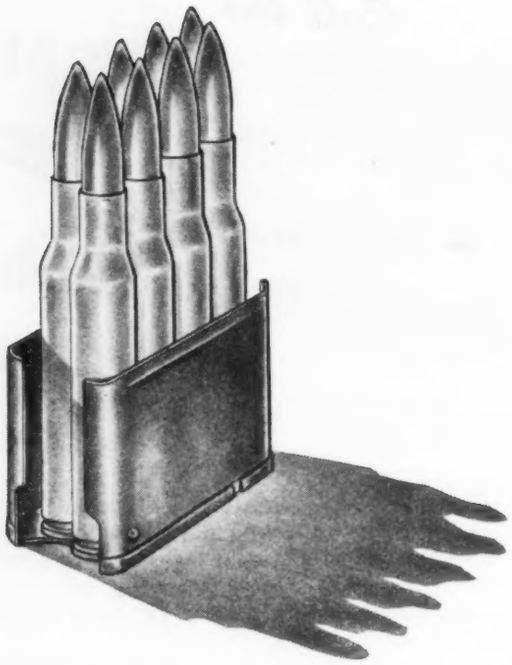
Ask a representative of the General Electric Wiring Materials Distributor near you to call. You'll like the friendly service that he will give you. His long experience enables him to offer suggestions that will help you in maintaining wiring systems . . . in converting wiring to war purposes . . . in planning new wiring.

The line of conduits, boxes and fittings, wires and cables and wiring devices handled by the General Electric Wiring Materials Distributor near you is large. You are sure to find materials suitable for your needs. Deliveries are expedited by the short distance between this distributor and you.

FOR G-E WIRING MATERIALS

Call your G-E Wiring Materials Distributor about conduit, wire and cable, and wiring devices. He is eager to serve you.

GENERAL ELECTRIC



WRAP IT UP, WE'LL TAKE IT

When Uncle Sam buys materiel for his boys, he's particular how it is "wrapped up." And rightly so, for if the output of your plant eventually arrives in Reykjavik, El Hamet, or Melbourne in a damaged condition, it is not only wasted but it may retard an action or endanger a soldier's life.

Because they are thoroughly familiar with *all* shipping container requirements, General Box engineers are helping scores of war products manufacturers solve their container problems—are helping them determine the best procedure to meet the various conditions, specifications and allowable alternates for overseas and domestic shipping containers.

Whether or not your war products are shipped in General Box containers, we will be glad to give you the benefit of our knowledge of specifications and availability of materials for the shipment of war products.

For manufacturers of war products: *General Heavy Duty Wire-Bound and Nailed Wooden* **BOXES** *and* **CRATES**
For Domestic Service: *Corrugated* **BOXES** *and Wood Cleated Fibreboard* **CRATES**
Discontinued for the Duration: *Generalite and Nailed Strapped* **BEVERAGE CASES**

GENERAL BOX COMPANY

GENERAL OFFICES: 504 North Dearborn Street, Chicago, Illinois
DISTRICT OFFICES AND PLANTS: Brooklyn, Cincinnati, Detroit, East St. Louis, Kansas City, Louisville, Milwaukee, New Orleans, Sheboygan, Winchendon; Continental Box Company, Inc.: Houston, Dallas.

sively the province of the Board. (Stewart Die Casting Corporation vs. NLRB.)

**Unlawful Interference*

NLRB warned that misplacing emphasis in a notice posted to his employees may constitute unlawful employer interference with his employee's rights. In this case an inside union was stressed, conveying the impression that the employer's preference was with the latter.

Held Interference

Management is warned of the danger of interpreting the Wagner Act. Such conduct was held to constitute interference, hence an unfair labor practice. (Max Ulman, Incorporation.)

A claim by an employer that a unit different from the one contended for by the union is appropriate, was held to constitute a refusal to bargain where such insistence was not in good faith. (Max Ulman, incorporated.)

Check These Points When Making a Layout

(Continued from page 105)

trying to draw a layout without enough templets.

26. Do not attempt to make a layout by actually moving the equipment. Not only may the equipment be damaged in the moving, but also a great deal of time would be wasted and many layout combinations might be left untried.

27. Make three-view drawings of the various models involved in dealing with the layout of aircraft assembly hangars. They should be made up as the layout is begun, showing accurate wheel location in the extended position and in the retracted position, hoist points, jack points, and wing clearances. Scale templets for actual layout should then be made with major assemblies completely or partially removed.

28. Make a complete list of all the equipment ordered or at hand for each shop.

29. Make sure in advance that enough data are available from all manufacturers about machine specifications and installation information. Much time can be wasted in trying to find out how a machine operates before making the installation.

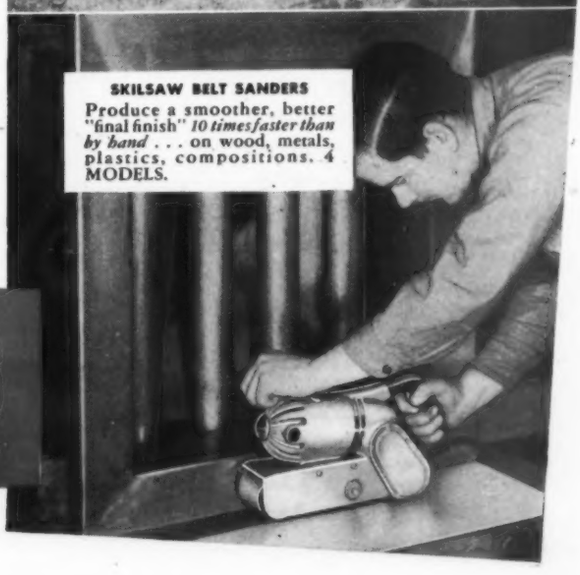
30. Keep a card record of machines ordered for each department. As each

On any surface...on any war job

SKILSAW
SANDERS and GRINDERS
GIVE YOU
Finer Finishing Faster!

SKILSAW PORTABLE GRINDERS
Grind down raised welds faster. Light, compact, powerful. Perfectly balanced for easiest day-long operation. 2 MODELS.

SKILSAW DISC SANDERS
Speed up all metal cleaning, sanding, filing, grinding with wire brushes (*illustrated*) cup wheels, polishing pads, etc. 6 MODELS.



SKILSAW BELT SANDERS
Produce a smoother, better "final finish" *10 times faster than by hand* . . . on wood, metals, plastics, compositions. 4 MODELS.

Have you welds to grind . . . metals to clean or "final-finishing" to apply on wood or brass or steel? You can do each job better *and faster* with one of these SKILSAW TOOLS! They're specially designed for easier handling. They're skilfully engineered for greater output per man *at war-time production speeds.* They're ruggedly built to stand the gaff of toughest 3-shift operation without time-wasting breakdowns.

Do you wonder why these SKILSAW SANDERS and GRINDERS are favorites everywhere for coarsest grinding or finest buffing. Ask your distributor for a demonstration and see for yourself!

SKILSAW, INC., 5043 Elston Ave., Chicago

New York • Boston • Buffalo • Philadelphia • Cleveland • Detroit
Indianapolis • St. Louis • Kansas City • Atlanta • New Orleans
Dallas • Los Angeles • Oakland • Portland • Seattle • Toronto, Canada

SKILSAW PORTABLE ELECTRIC TOOLS
★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

TOP EFFICIENCY with RLM Non-Metallic Reflectors!

Typical Wheeler convenience! Quick, easy access to operating parts by loosening two thumb-screws. Exclusive chain hangers support detached reflector. No loose screws, bolts or nuts to handle.

New "War-Aid" Fixtures insure availability of Wheeler SKILLED LIGHTING for war plants!

In spite of wartime metal scarcity, you can obtain fluorescent lighting fixtures with all the lighting efficiency and convenience of pre-war Wheeler "Skilled Lighting" units. Wheeler's 60 years' experience in better lighting has now produced top-standard "War-Aid" models requiring minimum metal!

Reflectors of "War-Aid" units are rugged non-metallic material. Non-flammable, moisture-resistant. Reflecting surfaces of chip-proof, washable baked enamel provide minimum efficiency of 80% in 48" 2-lamp units; 73% in 3-lamp units; and 73% in 60" 2-lamp units. Available for individual or continuous-run installations.

Write for full details of Wheeler "War-Aid" Fixtures and catalog of Incandescent Fixtures. **Wheeler Reflector Company, 275 Congress Street, Boston, Massachusetts.** New York . . Cleveland. Representatives in principal cities.

Distributed Exclusively Through Electrical Wholesalers

Wheeler REFLECTOR COMPANY

Lighting Equipment Specialists Since 1881

machine is received all missing info mation can be added to the card. sufficient time is available betwe purchase and setting up, cards shou show in advance the purchase ord number, exact size, location of outle location of worker, and any other p tinent information. Also, an equ ment number, if it can be secu from the accounting department.*

31. Layouts should show the equ ment number, purchase order numb or both, where possible, since all p sibility of error in later location a thereby be eliminated. In a la plant equipment can be easily l or misplaced. As soon as a machine uncrated, the equipment numb should be attached. In this man that machine can for all time be i into definite paperwork.

32. Make a master layout board, boards, with sufficient capacity to t care of all the plant buildings. A co venient scale for use is one-eig inch to one foot. A larger or sma one may be used, depending on t circumstances.

33. Make all layouts accurately the board and then photograph the If camera facilities are not availa make copies. There may be seve good ways of laying out a shop. having photographs taken and h sized photostats made, it is possi to record several good layouts and h them available for analysis to de mine the best method. Do not satisfied with a layout because it lo good; take all the templets off and a completely different layout. I member, you have to live with it long time.

34. Check lighting, to be su there is sufficient, either artificial natural, for all machines or wo areas.

35. Check power outlets to be su they are located correctly and that t correct wire sizes and voltages ha been specified.

36. Place machines that requi the same type of servicing equipme and the same type of utilities as ne together as possible, to lower install tion costs.

37. Locate instruments up again a wall where they cannot easily b damaged.

38. Determine bench requirement

*This item was well covered in "Mov Without a Shutdown," by Arthur Petz and Harry Rosenberg, FACTORY, Se tember, 1942. It cannot be overempha sized. We have found from experien that it pays dividends.

You Miss

a youthful face, and suddenly realize that perhaps by now it is in Iceland or Australia, or in Alaska or England or New Zealand.

Men whom many of us only yesterday still thought of as boys, are today fighting the nation's battles the world over, gallantly and well.

With them it isn't "business as usual".

Nor is it with us, who know that their lives imperatively depend on an adequate supply of rubber products.

Nor is it with the distributor and dealer, thus deprived of one of the lines which was fundamental to their business.

We regret more than we can express our inability to supply products for civilian needs to the same extent as formerly. However, once we are free to pursue our normal peacetime course, we shall again be ready to serve you as we have for more than 60 years.

BOSTON WOVEN HOSE AND RUBBER COMPANY

BWH

WORKS: CAMBRIDGE, MASS., U. S. A.
P. O. BOX 1071, BOSTON, MASS., U. S. A.

STOP THESE HIDDEN LEAKS
THAT *WASTE YOUR DOLLARS...*

Hundreds of Plants Effect Big Savings with Carey HEAT INSULATIONS

One pair of bare, 10-inch flanges at 350° F., waste one ton of coal per year. One foot of bare, 10" steam pipe, heated to 700° F., can cost you heavy heat loss. Figuring steam cost at 30c per million B. T. U., insulation 3" thick, shows an annual saving of $24.76 per foot of pipe.

Many industrial plants have hidden profit leaks in the form of waste in production, or excessive overhead. While these leaks may be small in themselves, they may add up to a very costly total.

Heat loss, through inadequately insulated pipe, is one of the most common of these hidden profit leaks. Scientific tests show, and hundreds of installations prove, that from 70% to 98% of this loss may be saved by correct insulation.

Fortunately for industry, there is a practical way, not only to find these wastes, but also to eliminate them. The Carey organization is equipped to help you uncover the profit leaks in your plant. A phone call or letter to our nearest branch, will bring a representative. Catalog "Heat Insulation for Industry" mailed on request to Dept. 31.

INDUSTRIAL BUILDING PRODUCTS OF
ASPHALT — ASBESTOS — MAGNESIA

ROOFING... SIDING... FLOORING... INSULATIONS... ROOFINGS AND CEMENTS
WATERPROOFING MATERIALS... EXPANSION JOINT... ASBESTOS PAPER AND MILLBOARD

The PHILIP CAREY *Manufacturing Company*
Dependable Products Since 1873
Lockland, • Cincinnati, Ohio •
IN CANADA: THE PHILIP CAREY COMPANY, LTD.
Office and Factory: LENNOXVILLE, P. Q.

in advance of making the layout, if possible. Do not merely throw in benches just to fill up space. However, in a tight shop make sure that adequate bench space is provided to fill the requirements.

39. Make sure that pit or foundation information for various machines is correct—whether drains and correct utilities are shown, whether standard sized grating will fit, whether floor thickness is sufficient to carry the machine without shifting.

40. Check building heights accurately to make sure that trusses and girders will clear all moving traffic or working equipment.

41. Standardize the size of doors—truck doors, trackless train doors, man doors, sliding doors, swinging doors. For safety, make sure that all doors swing out.

42. Check drawings carefully before issuing, to be sure that everyone involved has seen and signed them.

43. Layouts should be revised and carefully controlled to prevent errors caused by failure to mark the prints correctly.

44. Keep close control of drawings to insure that obsolete drawings are recalled. Be sure that everyone concerned has sufficient copies far enough in advance to make necessary plans.

45. Make out a table of machine working-area requirements, particularly where the machinery is not too well known to you. In addition, double check to be sure what the space requirements are for placing dies or tools in the machine.

(a) In the wood shop, large areas must be allowed around such machines as planers, jointers, bandsaws, circular saws, sanders, etc.

(b) In a sheet-metal shop allow plenty of room for such machines as roll brakes, shears, hydro-presses, and drop hammers. Remember that there must be room to install heavy dies.

46. What to do when space is inadequate:

(a) Build a mezzanine.

(b) Re-layout shop to eliminate waste space.

(c) Eliminate unnecessary benches.

(d) Time study operations to load each work area.

(e) Eliminate as much work in process as possible.

(f) Do part of work outside.

(g) Grade all adjacent space, and cover if possible.

(h) All materials that cannot be

BEARINGS THAT FLY

Must Have "What It Takes"

This remarkable new testing device is built on tracks that permit aircraft engines to be operated in positions of actual flight.

No other application in mechanical history has ever demanded so much from bearings of the size and weight of those supplied by Bunting for modern aircraft engines. New and unprecedented limits are imposed on all operations in the manufacture of these bearings. If unusual requirements today involve a bearing problem, Bunting experience and resources can aid you. The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.

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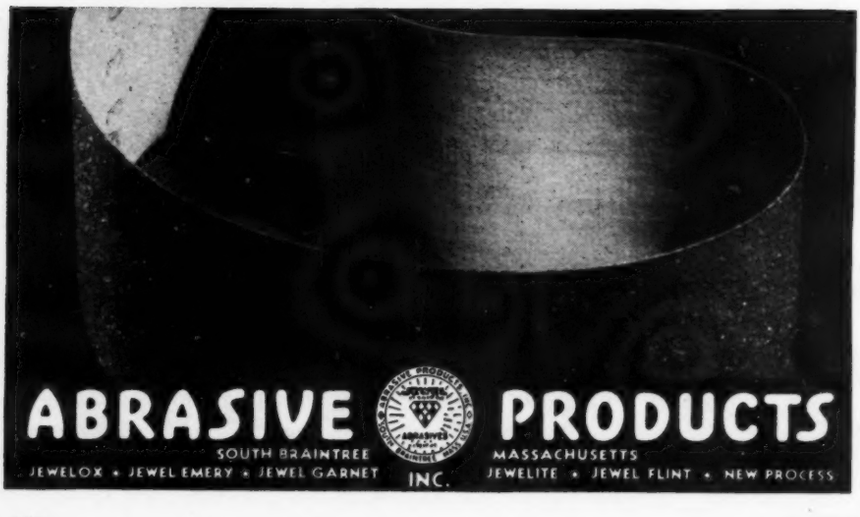
BRONZE BUSHINGS • BEARINGS • PRECISION BRONZE BARS

AIRCRAFT TUBING MAKER
SOLVES TOUGH
GRINDING PROBLEM
USES "SILVER STREAK" ABRASIVE BELTS TO
REMOVE HARD SCALE FROM ALUMINUM ALLOYS
Gets Consistently Excellent Results Over
18-Month Period
Consistently excellent results . . . over an 18-month period . . . under the toughest sort of production conditions – no wonder this manufacturer of tubing for aircraft hydraulic and conduit lines is completely sold on "Silver Streak" abrasive belts. AP's exclusive insulating treatment makes "Silver Streak" processed belts tougher and longer-lasting . . . keeps them cool, sharp, uniform-cutting even when grinding temperatures go up to 1700° – heat that "burns the heart" out of ordinary abrasives.

Chances are you've got tough grinding problems, too. If so, why don't you try to solve them once and for all with AP coated abrasives? Remember – there are AP abrasive cloths, belts, discs, for every type of grinding and finishing. And we're always glad to send generous FREE samples. So write today . . . tell us the grinding problems you're up against. Abrasive Products, Inc., 519 Pearl Street, South Braintree, Massachusetts.


ABRASIVE PRODUCTS
SOUTH BRAINTREE MASSACHUSETTS
JEWELOX • JEWEL EMERY • JEWEL GARNET
INC.
JEWELITE • JEWEL FLINT • NEW PROCESS

damaged by weather can be stored out of doors.

(i) Cut stock on hand to bone.

(j) Build cheap wooden shelters or set up tents, if requirements seem to be temporary.

(k) Cover spaces between buildings and use for storage.

47. Give special layout attention to certain types of equipment that require special installation and should be more or less segregated. Remember, for instance, that:

(a) Spot-weld equipment requires heavy power loads, so should be located near the power source.

(b) Noisy equipment such as speed hammers should be isolated in insulated rooms.

(c) Instrument rooms, dope rooms, and parachute buildings should be air conditioned to keep temperatures constant and eliminate dust.

(d) Machines such as grinders, sanders, planers, saws, and routers should be exhausted.

(e) Equipment giving off harmful fumes, such as plating, painting, anodizing, chromodizing, and heat-treating, should be exhausted.

(f) Proper ventilation should be allowed for large equipment such as air compressors.

(g) The location of shock machinery, such as drop hammers, should be as far away as possible from accurate machine shop equipment where close tolerances are being held.

48. Allow adequate space, when placing the templets on the layout for the building, for the following items, which sometimes require more room than you may have originally allowed for them:

(a) First aid rooms.

(b) Fire equipment.

(c) Lavatories (the ratio of wash stands and stools per building should be decided upon).

(d) Tool cribs (should be as centrally located as possible).

(e) Storerooms (should be large enough and centrally located).

(f) Offices for foremen, engineers, and clerical help (should be centrally located; not too large or fancy).

(g) Inspection.

(h) Drinking fountains.

(i) Telephones.

(j) Working space for each of the machines.

(k) Service to all machines, either by hand, lift truck, or hoist.

(l) Work in process.

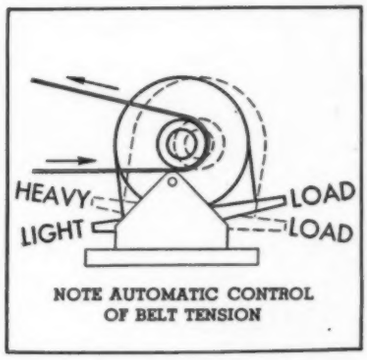
"9 Hours Output in Each 8-Hour Shift"

• • • reports one manufacturer who adopted American Econ-o-matic Short Center Drives for his punch presses. The gain in output resulted from reduced belt slippage—thus sustaining the RPM speed at correct level—and eliminating frequent "time-outs" for adjusting belt tension.

Improper belt tension creates many troublesome problems. When belts are too loose, you are losing RPM's and cutting down the productive output of your machines. When tension is too tight, belts and bearings burn up, forcing shutdowns and interrupting production.

By changing over to an American Econ-o-matic Drive, you can overcome these problems—boost your machine output—and greatly increase belt and bearing life. The Econ-o-matic Drive is an American Short Center Drive, either Flat belt or V-belt, with an Econ-o-matic motor base that gives you *automatic* belt tension control. No more worry about belts too tight or too loose—no lost RPM's—no slippage—no unnecessary "time-outs" to make frequent manual adjustments, after you install American Econ-o-matic Drives.

AMERICAN Econ-o-matic DRIVE



NOTE AUTOMATIC CONTROL OF BELT TENSION

The *load* governs the belt tension. Here is the heart of the Econ-o-matic Drive . . . the American Econ-o-matic Motor Base. It *automatically* and *instantly* matches belt tension to each variation in the pull of the load. When the load is *heavy*, motor base *pulls* and *tightens* the belt. When the load is *light*, motor base *slackens* and *loosens* the belt. No slide rails or idlers to adjust. It's *automatic!*

Check these advantages of the AMERICAN Econ-o-matic DRIVE (Short-center Flat — or V-Belt Type)

- ★ *Longer life for belts and bearings*
- ★ *No belt slip — no lost RPM's*
- ★ *Maintenance man-hours greatly reduced*
- ★ *Smooth, cushioned starting*
- ★ *Increased machine output*
- ★ *Substantial power savings*

Navy "E" for excellence awarded February 12, 1942

Get This New Econ-o-matic Catalog

36 pages of helpful information that shows you how to solve drive maintenance problems — how to increase belt and bearing life — how this drive can help you increase machine output. This catalog provides you with complete information on American Econ-o-matic Drives, and shows how to select the right drive for your purpose. Send for your copy. Write now.

The American Pulley Company
PHILADELPHIA, PENNSYLVANIA

HERE'S REAL NEWS!

New Guth Non-Metallic Reflectors Deliver More Light Than Porcelain Enamel!

4 Efficient Designs, for Every War Production Need!

GUTH Fluorescent is now made with Non-Metallic Reflectors to conserve vital materials for war industries. Yet this conversion has in no way necessitated any sacrifice in lighting efficiency! In fact the durable "300° White" synthetic Baked-Enamel plus the engineered design, actually produces greater light output than do Porcelain Enameled Steel Reflectors! Get this quality lighting—now available in non-metallic units!

Original MAZE-LITE for 2-40, 3-40 to 2-100 watt with 77° light-cutoff.
SUPER MAZE-LITE for 4-40 and 4-100 watt lamps. Powerful lighting units for high-intensities and high-bays.
Where lamp-shielding is required EGGCRATE MAZE-LITE fills-the-bill. Eggcrates like reflector are of non-metallic materials.
FLUOFLECTOR units for 1 and 2 rows of lamps. For inspection lighting and over benches.

Write Today for Newest Literature

FORTIETH YEAR OF Guth LIGHTING LEADERSHIP

THE EDWIN F. GUTH CO. • 2615 Washington Ave. • St. Louis, Mo.

Management Shorts

(*Continued from page 108*)

In part of the manufacturing divis there was no oil slinger for salvaging from chips. Also, there were sev types of oil in use as coolants in diffe machines. A large amount of good was being thrown away when chips w cleaned from machines and dumped i cars for disposal.

It was suggested that the small trucks used to transport the chips f the machine to the dump chute ha perforated false bottom so the oil c drain from the chips to the botto the truck. It could then be drawn and replaced in the machine from wh it came.

This idea has been used in other fo in the past, but this is a new ma in which oil can be salvaged from ch It has worked quite successfully, and shown an estimated annual savings $10,000 a year in the value of salvaged

Suggestion No. 3

Simplified welding procedure speeds production.

Made by Thomas H. Schelling and V toria Kocher, RCA Manufacturing C pany, Harrison, N. J.

In welding a 0.040-in. tungsten ment to a slightly flattened 0.100 tungsten filament lead on a specia power tube, the following complica procedure developed as a result of difficulty in welding tungsten to tungst (1) Tantulum flux was welded to filament leads; (2) filament tack-welde to the filament lead; (3) filame electrolytically cleaned; (4) welded p tion wrapped with 0.007-in. molybden wire; (5) filament, molybdenum wire, a filament lead then arc welded.

The present practice is as follow (1) Using 0.002-in. nickel sleeve 10 m long, assemble filament, filament lead, a nickel sleeve; (2) arc weld entire un

Results of the improved method a elimination of the tantalum flux a welding of flux, the operation of wrappi with molybdenum wire, and the electr lytic cleaning.

The saving on the improved procedu is $84 or 130 hours per 1000 assemblie An annual saving of $1950 or 3000 hou of direct labor will be realized.

Suggestion No. 4

Longer gage life obtained by weldi on both sides with hard surfacing allo

Made by Charles Trett, Jr., Cadill Motor Car Division, General Moto Corporation, Detroit.

A snap gage that does not lend itse to either chrome plating or peening fo repairing is being used in large number by this company. The method of repair ing was to weld a hard surfacing alloy o one side of the gage and then grind down to correct size. In this manner gage

SPEED UP PRODUCTION
Save time by stopping quickly with a compact integral brake unit
STOP FOR POSITION
Stop at the desired point for quickly and conveniently loading and unloading
MASTER
BRAKE RELEASE
BRAKE NORMAL
UNIBRAKE MOTORS
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Unibrake motors are very advantageous on hoists, elevators, inclined conveyors, etc. . . .
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Reduce the hazard of injury to workmen or damage to equipment which might cripple vital production

WARTIME PEACETIME
KEEP 'EM CUTTING
The Wells Way!

Choose a Wells and you will have a saw that is not only equal to the demands of war production but a tool that will help you solve your metal cutting problems in peace time competition, for years to come.

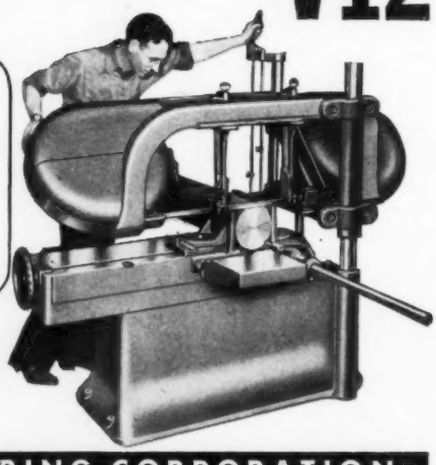
Their long experience in saw design and manufacture has enabled Wells engineers to build the greatest durability and cutting efficiency into the New Model 80 and V-12.

Tested and proved on tough cutting jobs like tool steel and castings of all types and shapes, they are ready to do your metal cutting with speed and accuracy—for the duration and many years after.

Phone your Mill Supply dealer or write direct.

WELLS 80

Wells Has Established Leadership V12



SPECIFICATIONS
SERIES 80 METAL SAW

Capacity: Rectangle	8" x 16"
(spec. bowed guides)	5" x 24"
Rounds	8" dia.
Speeds: ft. per min.	60, 90, 130
Motor	Specifications optional

V-12 METAL SAW

Capacity: Rectangle	13" x 16"
Round	13" dia.
Speeds: ft. per min.	50, 90, 150
Guides	Adjustable
Feed	Hydraulic-Controlled
Vise	New quick acting type
Motor	Specifications optional

A large stock of blades is available at all times

Wells SAWS
THE SIGN OF SERVICE

WELLS MANUFACTURING CORPORATION
Wells METAL CUTTING BAND SAWS
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can be repaired many times. The longer wearing alloy was rewelded each time on the same side. The advantage of its longer life was not being obtained as the side of steel wore faster, the heat of welding having a tendency to anneal it.

Suggestor realized that longer gage life could be obtained if, the second time these gages were built up, the alloy were welded to the side opposite that built up the first time. After the second repair, this gives alloy welded tips to both sides the snap gages and greatly increases their life.

It is estimated that repair labor for these gages will be reduced by 8000 hours yearly.

Suggestion No. 5

Soldering worn electrodes saves scrap inserts.

Made by Thomas Flynn, RCA Manufacturing Company, Harrison, N. J.

To increase the life of electrodes, it was suggested that discarded, worn-down electrodes of the same type be silver soldered together. A two-year supply of scrap inserts are being salvaged in this manner. Material savings are estimated at $2557.50 for the first year.

Suggestion No. 6

Samples of work from screw machines gives workman definite size to work by.

Made by Harry Conant, Submarine Signal Company, Boston.

This plan provides for keeping a sample of all pieces of work done on the screw machines. Approximately an inch of stock on the end of the finished product is held in the chuck or collet for the next set-up. The workman then has a definite size by which to set his tools and stops. On the small machines many minutes are saved and on some of the large jobs, as much as two to three hours.

Suggestion No. 7

Triangular metal tool prevents denting around rivet hole.

Made by John A. Wilson, Curtiss-Wright Corporation, St. Louis.

While riveting metal skins to stringers, dents frequently occur around the rivet hole. Unless these dents are corrected while they are small, they often develop into serious distortions in the metal surface. This necessitates reworking or scrapping the part, both costly in time and material.

A thin, triangular-shaped metal tool, which can be inserted easily between the stringer and the skin, has been devised by the suggestor to prevent such denting. A metal bar is used to back the stringer, and the dented area of the metal surface is struck with a fiber mallet until smooth.

The practice is not new, but the tool is an improvement. Formerly the worker would insert a steel scale between the stringer and the skin. When the dent area was larger than the width of the scale, the metal skin would often stretch under the blows of the fiber mallet. The

FORETHOUGHTFULNESS

In 1942 these men, with their associates, rushed to record-breaking completion a large manufacturing plant for the Army on a three thousand acre site.

By forethoughtful planning they designed, built, and equipped this great project six months ahead of schedule, and several million dollars under previously estimated costs.

In 1943 ultimate speed in industrial designing, construction, and equipment work, with careful planning for post-war use, is of paramount importance.

What we have done for others, we can do for you. For our preliminary suggestions and estimates, please communicate either with our New York or Cleveland Offices quickly.

The H.K. Ferguson Co.

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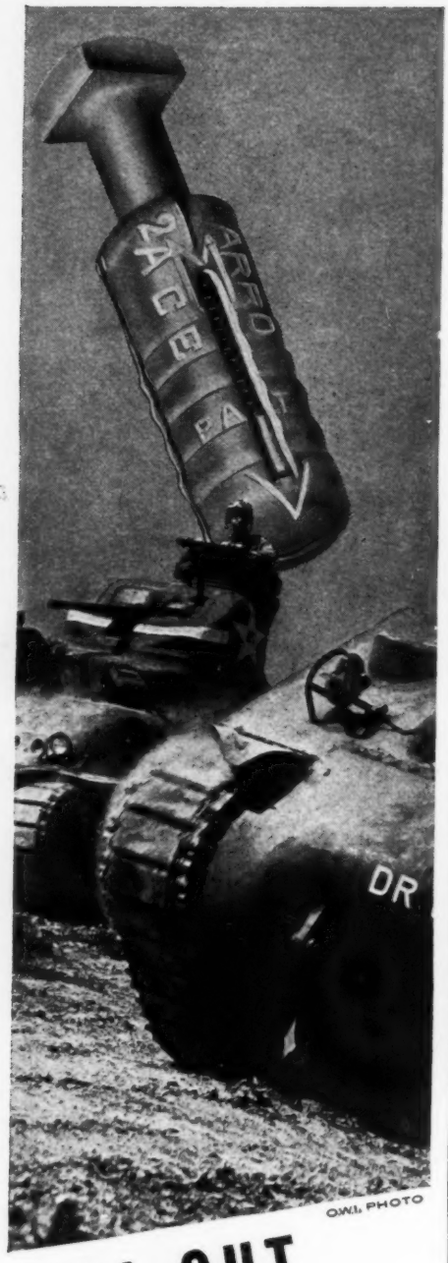
CLEVELAND **NEW YORK**



ALL OUT
for the
WAR EFFORT

TRADE ARRO MARK

EXPANSION
BOLTS
AND ALLIED PRODUCTS

ARRO EXPANSION BOLT COMPANY
MARION, OHIO

new tool, having a tapered width, can be used for dents up to approximately 1¾ inches and provides a flattening surface of the proper width.

Suggestion No. 8

Lower tables save lifting, eliminate dropping of parts from height.

Made by Paul Hegenbarth, Wright Aeronautical Corporation, Cincinnati.

Rolling parts tables used in assembly were too high. By lowering them 8 to 10 inches, extra lifting is cut down in

all departments (teardown, segregation, inspection, and final benches). The hazard of dropping parts is eliminated to a great extent. Also, the height of the lowered table matches the final benches.

•

Workers Pledge to Speed Up Production

SOURCE—Johns-Manville, Waukegan, Ill.

War workers in this plant have signed the following pledge to "stay on the job" and "increase production":

"I realize that I am a soldier of production whose duties are as important in this war as are those of the man behind the gun.

"I will do my work well and efficiently and will stay on my job producing to the best of my ability until my shift ends.

"I will carry out my duties in accordance with instructions.

"I will think before I act.

"I will endeavor to save material by avoiding mistakes and spoilage.

(Continued on page 230)

Castolin Eutectic
LOW TEMPERATURE WELDING

Large two cylinder air compressor with badly cracked water jacket. Salvaged with Castolin Eutectic Low Temperature Welding Alloy. No general preheating. Time 1½ hours.

IMPROVED RECLAMATION OF CAST-IRON CASTINGS

WHY waste time and materials? Reclaim broken, cracked, worn or defective castings, easily, economically. Use Castolin Eutectic Alloy #14 (gas welding) and Castolin Eutectic Alloy #24B (AC-DC metallic arc). These new low temperature welding alloys assure you of a completely machinable, color matching, stress and distortion free weld every time.

Prominent manufacturers now use Castolin Eutectic Low Temperature Welding Alloys #14 & #24B in place of "hard to get" bronze welding rods. Castolin Eutectic Alloys #14 & #24B contain no scarce metals . . . available with priority A9.

Write for DATA BOOK HB

Castolin Eutectic Low Temperature Welding Alloys are the *original* low temperature alloys that are revolutionizing production welding, maintenance welding and salvaging in war plants throughout the nation. There are 38 specialized rods for every metal and every welding job. Made only by Eutectic Welding Alloys Company.

Tool Salvaging Poster for your Shop Free!

Some Territories Available for Manufacturers Representatives

EUTECTIC
WELDING ALLOYS CO.
40 Worth St. New York, N. Y.

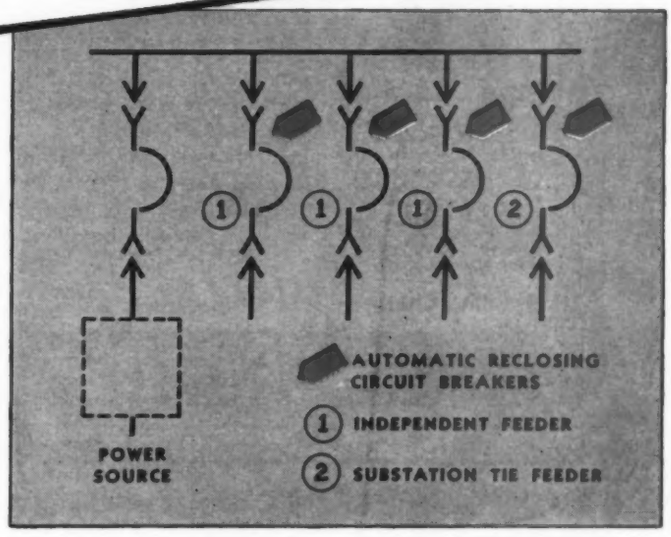
News of Electrical Protection

Wider Industrial Use of Automatic Reclosing Circuit Breakers

AMONG ENGINEERS in industrial plants, there is evidence of growing interest in the advantages of automatic reclosing circuit breakers. Much of the interest centers on applications for d-c systems in which, after outage, it is safe and otherwise desirable to have service restored at the instant a fault has been cleared.

Wider use of unattended substations, where automatic reclosing is necessary, has helped in some degree to popularize the automatic type of equipment. But the basic causes are the immediate and long-range values that engineers now see in providing means to assure the best continuity of service. War-time pressure for peak production is proving to many men, more pointedly than ever before, the sound and lasting economy of avoiding needlessly prolonged interruptions.

Automatic reclosing of circuit breakers is a thoroughly established art. On mining and street-railway systems, I-T-E has literally hundreds of installations. The equipment localizes faults—confines a disturbance to that portion of the system on which it arises. As soon as conditions are right, the circuit breaker itself restores the power.



Schematic diagram indicating use of automatic reclosing circuit breakers on feeders and for sectionalizing a tie-line to another substation.

Make a note about automatic reclosing circuit breakers. Industry will be using more of them. Keep them in mind for long-range plans. I-T-E engineers, whose experience dates from the pioneering installations years ago, will help you.

Representatives in Principal Cities

I-T-E

AIR SWITCHGEAR

IMMERSED IN AIR — ENCASED IN STEEL

The Army-Navy "E" for Production Excellence

CIRCUIT BREAKER CO., PHILADELPHIA, PA.

Another production problem Solved the READING way!

Here's Useful Data

. . . to help you solve your handling problems. This new 16-page booklet contains information about trolleys, end trucks, gear cases and lower blocks. On-the-job photos show how Reading Cranes are boosting output, saving hours in many plants.

•This battery of 18 cranes is visible proof that it pays to *standardize* on Reading Traveling Cranes! • Typical of many at work in almost every industry, these 5-ton Reading Traveling Cranes stay on the job through many shifts. They are *engineered* to keep production up, maintenance down. • When you have a tough materials handling problem to solve, remember that it pays to rely on Reading's engineering ability.

Reading Chain & Block Corporation, 2103 Adams St., Reading, Pa.

READING CHAIN HOISTS·ELECTRIC HOISTS OVERHEAD TRAVELING CRANES

BALDOR BALL BEARING GRINDERS

A COMPLETE LINE
(Bench & Pedestal Types)

Shown above is BALDOR Grinder No. 121, 2 h.p. ball-bearing motor; 1725 r.p.m., Price, complete with 12" x 2" wheels and starter. $205.60

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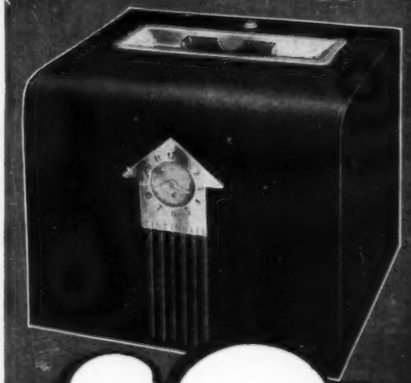
For Plant and Office



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Time Recorders

Dignified, simplified method of time and job recording for plant and office use. Designed and built by pioneers in the development of Time Recording Machinery for almost half a century.

Built and Guaranteed by
THE CINCINNATI TIME RECORDER CO.
Cincinnati, Ohio
Branch Offices in Principal Cities

(Continued from page 228)

"I will be careful of my health and prevent accidents to avoid loss of time.

"I will keep my working place tidy and in order.

"All to the end that we may succeed in our efforts to increase production and attain the goal set as necessary to carry us to the final decisive victory over our treacherous enemies who are now threatening the homes of our children and the liberty of our nation."

•

Models Encourage Good Housekeeping

SOURCE — General Electric Company, Schenectady

Credit for cleaner, more healthful shops at various General Electric Company works goes to life-sized figures of a little Dutch boy and girl "Spic" and "Span."

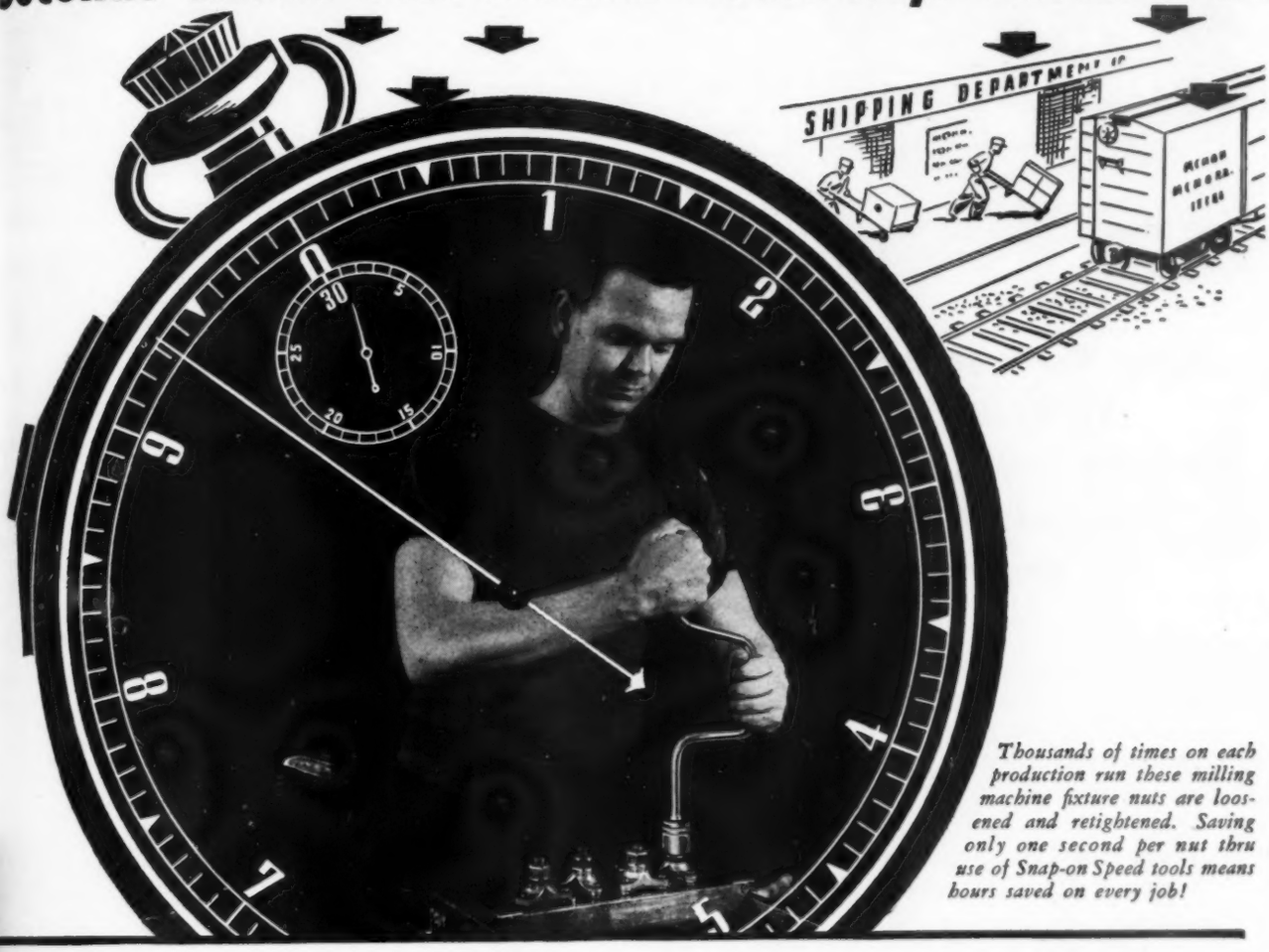
In some sections of the plants, a good housekeeping drive has been started to impress upon the workers that dirt slows production, causes things to wear out more quickly, and that carelessness with tools and materials causes unnecessary accidents. In shops where "housecleaning" is needed, a figure is placed of "Sloppy Sam," who represents the opposite of Spic and Span. When improvement in neatness is realized, Spic and Span take the place of Sloppy Sam.

Dutch models of cleanliness impress workers with need for shop neatness

In other places in the plants, 6-in. cutouts of Spic and Span are used. Foremen place them on benches that are neat and clean. In some shops the improvement has been so noticeable that quantities of the cutouts are made available with the invitation, "If your bench is neat and clean, take one."

The Spic and Span drive is part of the company's over-all Q+Q=V (Quality plus Quality equals Victory) program to speed up war production.

Seconds saved here... Can mean days saved here



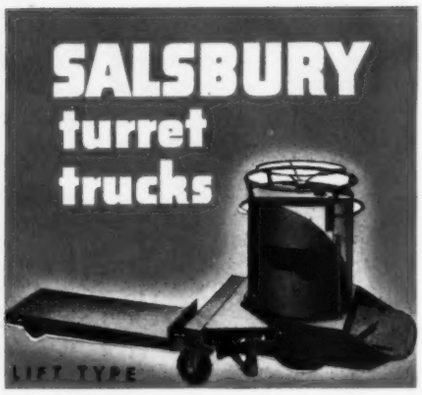
Thousands of times on each production run these milling machine fixture nuts are loosened and retightened. Saving only one second per nut thru use of Snap-on Speed tools means hours saved on every job!

Get Faster Production with Snap-on Tools

With precision hand tools such as Snap-ons, your operators can turn out *more* work . . . faster and easier. That's because Snap-ons are scientifically designed for leverage, shaped and balanced for sureness-of-hand and swiftness in handling, they're accurate to the thousandth, built of fine steels for enduring serviceability under the most exacting production conditions.

A wide range of industrial requirements are covered by the 3,000 tools in the Snap-on line . . . and prompt attention to your requirements is assured by an organization of 35 factory branches, staffed with experienced tool men who are glad to bring tools direct to your office or plant to "see and try before you buy". Catalog and complete information on request. Write . . .

SNAP-ON TOOLS CORPORATION
8044-B 28th AVENUE KENOSHA, WISCONSIN



Speed War Production by Moving Needed Materials Faster, Easier and With Less Manpower

Get more productive hours from your manpower and equipment by using Salsbury Turret Trucks for moving materials within your plant. One man can do the work of three, machines are kept humming, production climbs, and material handling costs *go down!*

Salsbury Turret Trucks are fully automatic, easy to maneuver, safe and simple to operate and are low in first cost and operating cost.

Fast, sturdy and powerful, these low-cost industrial power trucks are available in three models—lift, cargo and tractor. Each is designed to handle your specific materials transportation most efficiently and economically. Write Dept. T-1 for illustrated bulletin, prices.

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NUTTING TRUCK AND CASTER COMPANY
Faribault, Minnesota
Under license of Salsbury Corporation, Los Angeles

SALSBURY turret trucks

BOOKS

INDUSTRIAL SUPERVISION

Lewis A. Froman, Ph.D., Dean of Millard Fillmore College, University of Buffalo, and Scott B. Mason, Industrial Engineer, University of Buffalo. The Foundation Press, 222 W. Adams St., Chicago. 341 pages. Index. $2.50.

Fundamental principles of good supervision presented in simple, direct terms. The authors believe that the study of this book will be most effective when the student has had at least some work experience. He will then be able to appreciate the value of certain considerations that might otherwise be meaningless. Chapter headings include First Principles, Bringing Out the Best in People, Care and Economy of Materials, Manufacturing Efficiency, Quality Control, Production Control, Building an Organization, Preparation for Advancement, and many others.

DIE CASTING FOR ENGINEERS

New Jersey Zinc Co., 160 Front St., New York. 148 pages. Photographs, drawings, tables, index. $1.

An impartial analysis of all the many alloys in use, so that the engineer may make intelligent utilization of the inherent advantages of the process itself. Covers history and growth of die casting, principles and history of die casting machines, elements of die construction, applications, specifications, inspection and tests, methods and tools for flash removal, machining practice, finishes, design.

WARTIME REFRESHER IN FUNDAMENTAL MATHEMATICS

Lt. W. C. Eddy, U.S.N., A. H. Brolly, Chief Instructor, Ens. E. S. Pulliam, U.S.N.R., E. C. Upton, G. W. Thomas, U.S. Naval Training School, Chicago. Prentice-Hall, Inc., 70 Fifth Ave., New York. 248 pages. Examples, problems. Regular edition $1.40, text edition, $1.05.

Planned to provide practice in the application of mathematics and to present all working formulas in the language of the layman. Subject matter is divided into units of days of the week. Student will find it advisable to read glossary and text which precede each day's assignment, as well as the "cues" that are intended to show proper methods of operation. Final section of each day's work carries the answers worked out in detail, step by step. Twenty days' work is provided.

BUSINESS AS A SYSTEM OF POWER

Robert A. Brady, Columbia University Press, Morningside Heights, New York. 340 pages. Bibliography, index. $3.

Business has become enormously powerful, and has centralized and mobilized its forces by peak trade associations. Whether this power is exercised for the popular good, whether it can be reconciled with continuation of a democratic way of life or must lead to some form of totalitarianism, are questions that must be answered. This book presents the facts on which answers may be based—they may form the basis of many an argument.

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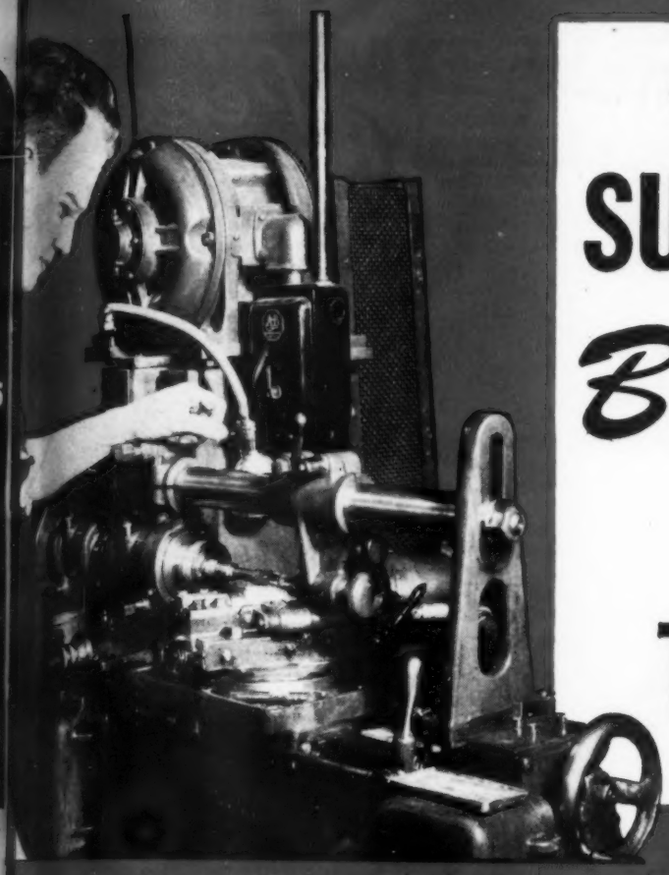

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BOOKLETS

OUTLOOK ON PRODUCTION, MANPOWER, AND WAGES. L. C. Morrow, Editor, Factory Management and Maintenance; Lt. Col. H. J. Schwabacher, Manpower Branch, U. S. War Department; Ralph T. Seward, National War Labor Board. Production Series No. 139. American Management Association, 330 W. 42nd St., New York. 23 pages. 50c.

MAKE OR BUY. James W. Culliton. Business Research Studies No. 27. Harvard University Graduate School of Business Administration, Bureau of Business Research, Soldiers Field, Boston. 130 pages. Case studies, tables, bibliography. $1.50.

GUIDE FOR THE STUDY OF AMERICAN SOCIAL PROBLEMS. Compiled for the American Social Problems Study Committee. Columbia University Press, Morningside Heights, New York. 181 pages. $1.

WAGE AND SALARY STABILIZATION. Research Institute Analysis 24. Research Institute of America, 292 Madison Ave., New York. 59 pages. Forms. $2.

ASSIMILATING WOMEN WORKERS—a panel discussion, and INDUSTRIAL ABSENTEEISM, A. T. Court, Labor Economics Section, General Motors Corp. Production Series No. 141 American Management Association, 330 W. 42nd St., New York. 35 pages. 75c.

HOW CAN WE PAY FOR THE WAR? Maxwell S. Stewart. Public Affairs Pamphlets No. 74. Public Affairs Committee, Inc., 30 Rockefeller Plaza, New York. 31 pages. Drawings, bibliography. 10c.

THE WAR PRODUCTION DRIVE and SUGGESTION SYSTEM TECHNIQUES. W. G. Marshall, War Production Drive Policy Committee, and others. Production Series No. 142. American Management Association, 330 W. 42nd St., New York. 23 pages. 50c.

NUTRITIONAL PROGRAMS FOR INDUSTRIAL EMPLOYEES. Industrial Relations Section, Department of Economics and Social Institutions, Princeton University, Princeton, N. J. 8 pages. Selected references. 20c.

THE MEDICAL DEPARTMENT IN WAR INDUSTRIES. Industrial Relations Section, Department of Economics and Social Institutions, Princeton University, Princeton, N. J. 8 pages. Selected references. 20c.

JOB METHODS TRAINING AND OTHER PRODUCTION HELPS. Channing R. Dooley, Training Within Industry, War Man-

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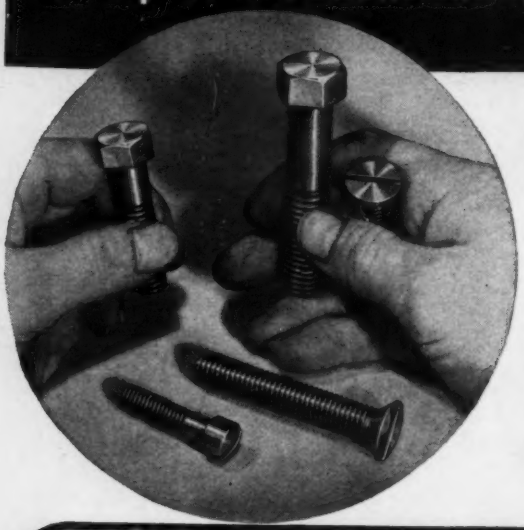

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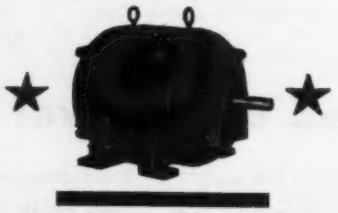

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power Commission; Clifton Cox, Training Within Industry, War Manpower Commission; Harold V. Coes, Ford, Bacon & Davis, Inc., E. J. Tribble, Worthington Pump & Machinery Corp. Production Series No. 140. American Management Association, 330 W. 42nd St., New York. 35 pages. 50c.

MEDICAL SERVICES IN INDUSTRY. A selected, annotated bibliography with particular reference to health programs in war industries. Industrial Relations Section, Department of Economics and Social Institutions, Princeton University, Princeton, N. J. 11 pages, mimeographed. 10c.

HOW MANAGEMENT CAN INTEGRATE NEGROES IN WAR INDUSTRIES. John A. Davis. New York State War Council, Committee on Discrimination in Employment, 80 Center St., New York. 44 pages. List of corporations and persons with important experience, bibliography. No charge.

COLLAPSE OR BOOM AT THE END OF THE WAR? Harold G. Moulton and Karl Schlotterbeck. The Brookings Institution, Washington, D. C. 40 pages. Charts. 25c.

HOW TO "THINK UP." Alex Osborn, Ph.M., Executive Vice-President, Batten, Barton, Durstine & Osborn, Inc. McGraw-Hill Book Co., 330 W. 42nd St., New York. Foreword by Bruce Barton. 38 pages. Board edition, 50c, paper edition, 25c.

•

ON THE CALENDAR

FEBRUARY

10–12, American Management Association, Personnel Conference, Palmer House, Chicago. James O. Rice, Assistant Secretary, 330 West 42nd St., New York.

MARCH

23–25, Safety Engineers, Annual Convention, Hotel Pennsylvania, New York. Greater New York Safety Council, Lincoln Building, 60 East 42nd St., New York.

25–27, American Society of Tool Engineers, Machine and Tool Progress Exhibition, Milwaukee Auditorium, Milwaukee. Executive Secretary, Ford R. Lamb, 2567 West Grand Blvd., Detroit.

APRIL

9–10, Midwest Power Conference, Palmer House, Chicago. Stanton E. Winston, Conference Director, Illinois Institute of Technology, 3300 Federal St., Chicago.

13–16, American Management Association, Packaging Conference, Astor Hotel, New York. James O. Rice, Assistant Secretary, 330 West 42nd St., New York.

20–23, National Electrical Manufacturers Association, Spring Meeting, Palmer House, Chicago. R. J. Blais, Convention Manager, 155 East 44th St., New York.

26–28, American Society of Mechanical Engineers, Spring Meeting, Black Hawk Hotel, Davenport, Iowa. C. E. Davies, National Secretary, 29 West 39th St., New York.

28–30, American Foundrymen's Association, 47th Annual Meeting, Hotel Jefferson, St. Louis. American Foundrymen's Association, 232 West Adams St., Chicago.

Protection...
AGAINST BOILER HEAT OR BLIZZARD COLD

Your motor starters may never have to cope with such extremes in temperature, but even *normal* variations will affect the operation of across-the-line starters unless they are equipped with *compensated* overload relays.

Only 5-¾" x 5-¼" x 4-⅛"

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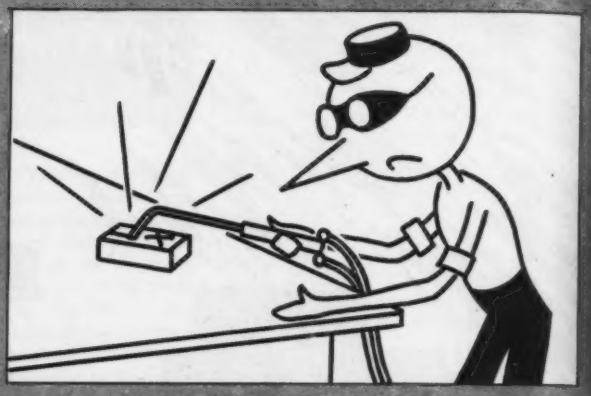
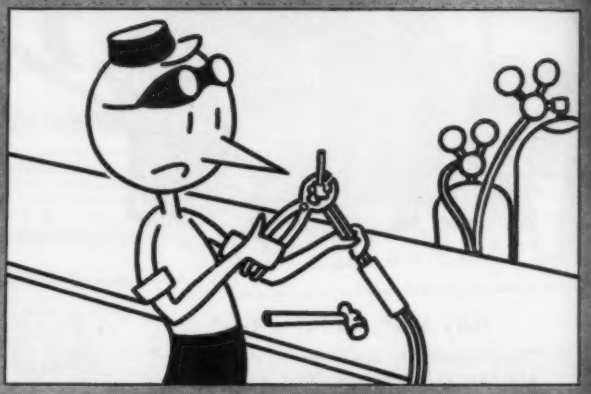
WELDER SPARE THAT TORCH!

1 Don't use your torch as a hammer. It isn't built to stand such abuse. Even the best cutting torch makes a very poor hammer.



2 Don't rub your torch tip on the work or rough surface to clean it. It's liable to damage the orifices and impair the efficiency of the torch.

3 Don't pry metal plates or sheets apart with your welding torch. A bar or chisel does a much better job, and eliminates danger of damage to the torch.



4 Don't use gas pliers on torch or regulator connections. Use your regular torch wrench and prevent damage to brass parts.

Take Good Care of Your Welding Equipment

Common-sense tells you that good care will mean longer service from your torches, tips, and regulators. That's important today because welding and cutting equipment is hard to replace.

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3 NEW WAYS

to speed output . . .

1 "MX" WHEELS combine light stock removal with finishing and polishing action. They are free-cutting and are to be used dry on any portable machine. For breaking down sharp edges on gears etc., finishing and polishing out-of-the-way places.

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KEEPING pace with the war program, Carborundum has developed many new and novel coated abrasive products—Weapons for Production to speed output, insure high finishes and lower costs. Here are three of the most versatile and useful! They are particularly adapted for finishing and polishing out-of-the-way places on airplane engine parts and similar metal work.

1. ***"MX" Wheels*** are fabricated from cotton fibres intimately intermingled with Aloxite Brand Aluminum Oxide or Carborundum Brand Silicon Carbide grain. They are made in six grades of hardness.

2. ***Cloth Cartridge Rolls*** are made in diameters from ⅜ to 1 inch of tightly wound, glued strips of metal working abrasive cloth. Rolls are from 1 to 3 inches in length.

3. ***Multi-Slotted Discs*** afford a time-saving, cost-saving way to burr and polish the edges of holes in metal work. Produced in all necessary grits, in diameters from ½ to 6 in.

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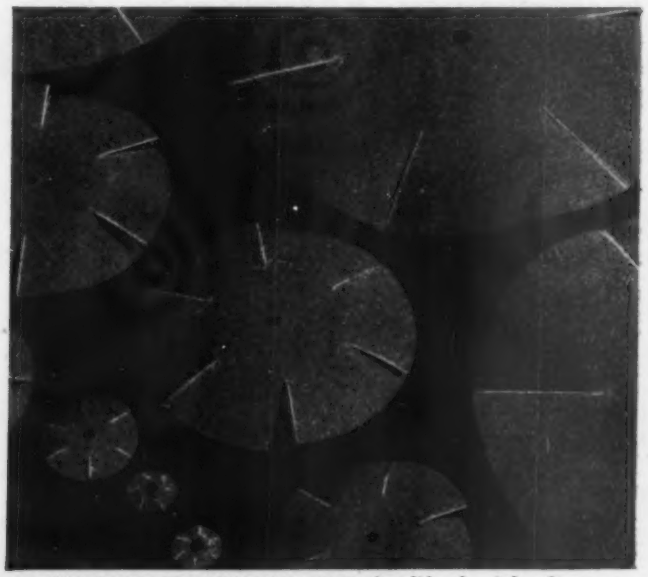
2 CLOTH CARTRIDGE ROLLS can be mounted on a spindle and used on a portable tool for finishing hard-to-reach surfaces. As abrasive surface wears down, cloth backing can be torn off to expose fresh layer of abrasive.



3 MULTI-SLOTTED ABRASIVE DISCS simplify the job of removing the burr and producing the true radius required on holes. Used in a portable power tool, the disc "cones" backward, finishing only the hole edge. When two discs are mounted together back to back, they can be used to finish both edges.

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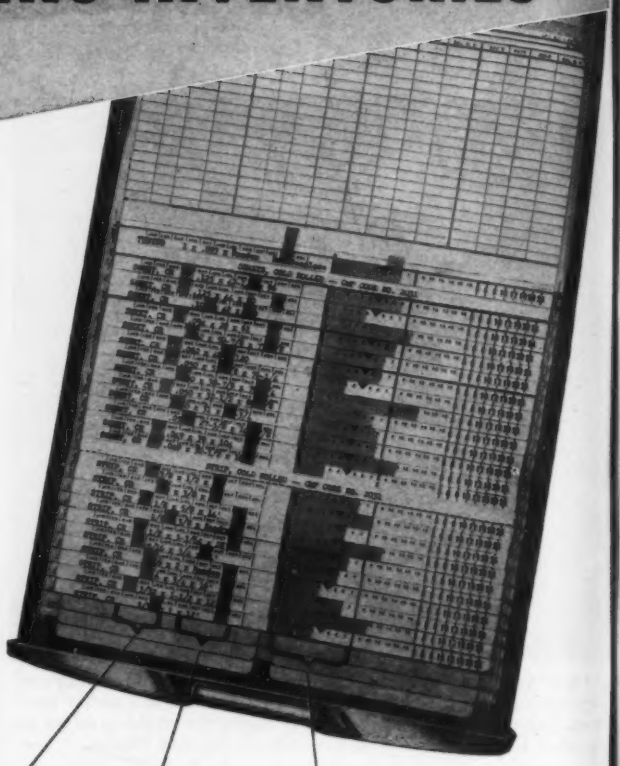

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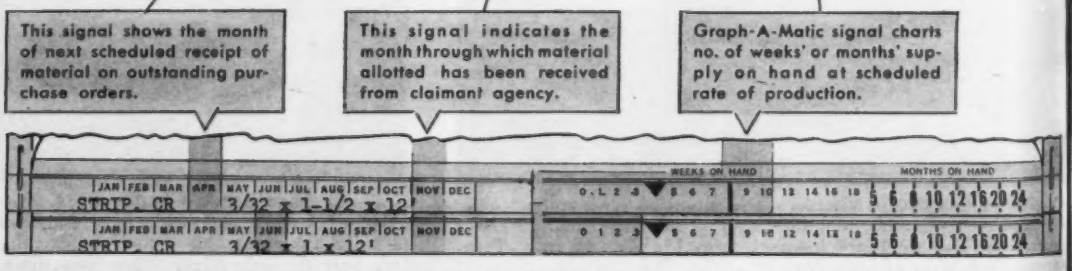
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WARTIME restrictions make copper products hard to get — this includes electrical wire and cable. It will pay you to protect what you have.

Anaconda's Preventive Maintenance Plan will help you check to see that cables in your plant are not being abused.

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NOTE: Through this Preventive Maintenance Plan you may uncover the evidence necessary to obtain an "emergency repair priority." This is explained fully in the plan book.

ANACONDA'S PREVENTIVE MAINTENANCE PLAN

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Please send copy of the Anaconda Preventive Maintenance Plan for safeguarding production.

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It takes specialized fighting equipment . . . as much as our vast industries can produce, working every last hour on the clock. For we are sending millions of men against a mechanized foe, and our men must have fighting tools to stand a fighting chance. Nowadays, a *poorly* equipped soldier would stand little more chance than a man with bare hands against bayonets.

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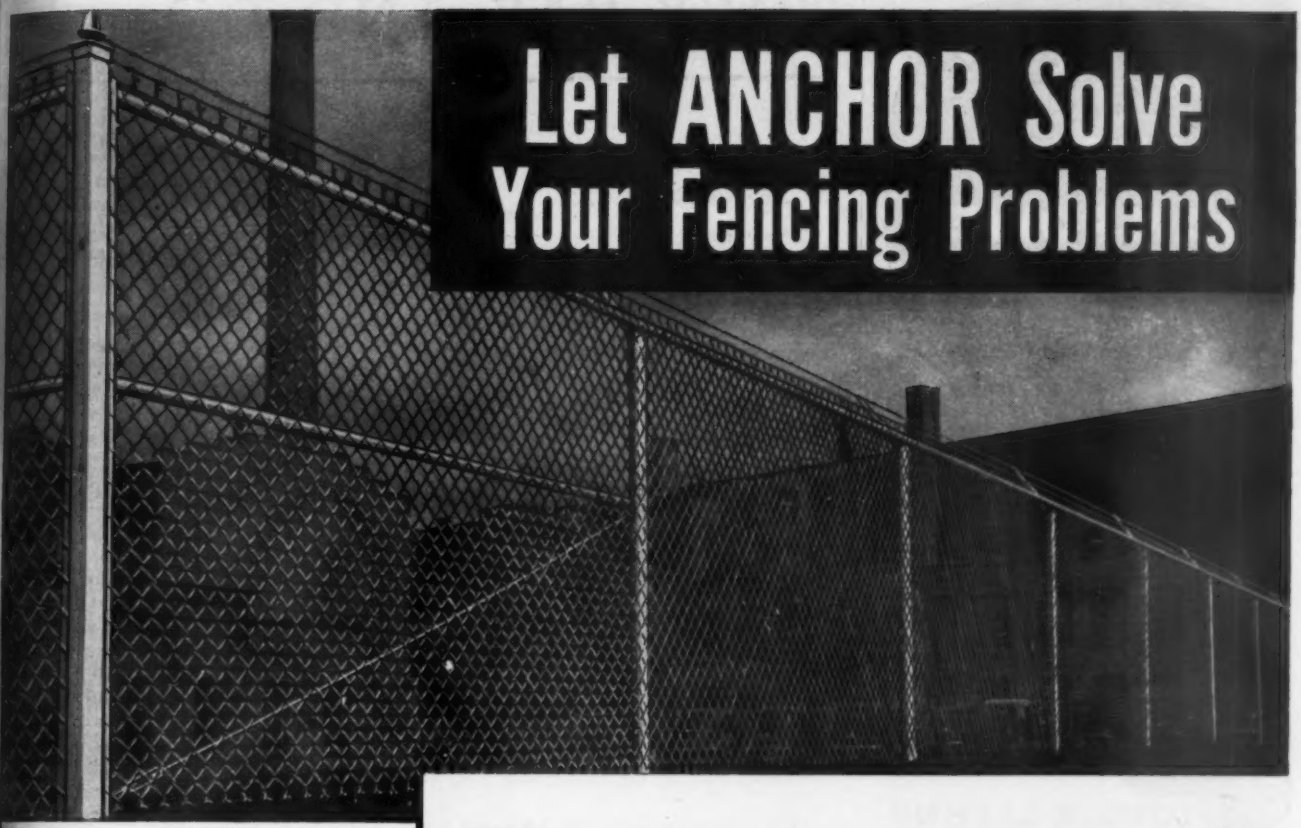

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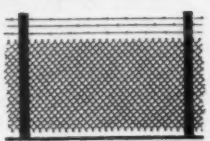

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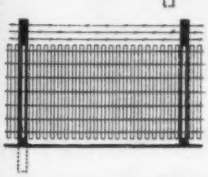
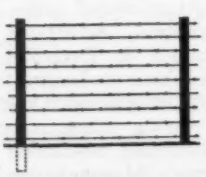


-3- *Barbed Wire on Wood Posts*



Anchor Also Makes:

Chain Link Fences • Woven Wood Fences • Barbed Wire Fences • High Board Fences • Indoor Factory Enclosures for Vital Installations • Outdoor Storage Enclosures • Fencing for Plant Traffic Direction, Control of Shifts • Safety Screening Devices • Factory Window Screening • Low-cost "Rush" Factory Partitions • Inexpensive Storage Bins • Cashier's Cages, Payroll Protection.

NOW as before, no matter what your fencing problem, count on Anchor to give you the best industrial fencing available. Restrictions make it impossible to obtain standard Anchor Fence (illustrated above) unless your problem deserves special government consideration. Nevertheless, acceptable substitutes (illustrated at left) are still available.

Illustration No. 1 shows Chain Link Fabric of 12-gauge wire, galvanized after weaving, stapled to wood posts, and with 3 strands of barbed wire stretched on the posts above the fabric. This fence is 7 feet high and provides an effective barrier. It is available under priority regulations to the Army, Navy, Maritime Commission and their agents.

Illustration No. 2 shows a woven wood fence on wood posts with 3 strands of barbed wire. There are no restrictions against it, but priorities are necessary.

Illustration No. 3 shows a 7-foot protective fence which is composed of 9 strands of barbed wire stapled to strong wood posts. Priorities are necessary.

Experienced erecting crews operating out of Anchor's sixteen branch offices can erect any of the described fences quickly and efficiently. If you require some other type of barrier, such as a board fence or concrete wall, Anchor men can do it better. If you want your present fence moved to a new location, or if it needs realigning, repairing, or painting, call in our experienced men. Our nation-wide organization means quick service.

Consult the classified section of your telephone book or write for address of nearest Anchor representative. No obligation. You will get prompt action and discover how Anchor's specialized knowledge can save you time, money and headaches on any fencing problem. Anchor Post Fence Company, 6620 Eastern Avenue, Baltimore, Maryland.

ANCHOR FENCE

ON ANY FENCING PROBLEM CALL ANCHOR

Use LONGER-LASTING

CAR-NA-VAR
THE PERFECT FLOOR TREATMENT

CAR-NA-LAC
LACQUER-LIKE FLOOR FINISH

CAR-NA-SEAL
WEARS LIKE LEATHER

ON YOUR FLOORS!

We can't tell you where to get more men... but we definitely can show you how to get along with a lot less when it comes to keeping your floors in tip-top condition. Just use longer-lasting Car-Na-Var floor treatments.

True, Car-Na-Var products cost a little more per gallon. But being longer-lasting, one man can do the job that may take two, three or as many as four men with ordinary floor waxes. You save vital labor...and in the long run actually cut material costs as well. Ask us to prove it with a free demonstration.

FREE BOOK

A handy reference book for the maintenance man, giving the step-by-step treatment for every type of floor. Write for a copy today...no obligation.

CONTINENTAL CAR-NA-VAR CORP.
1402 E. NATIONAL AVE. BRAZIL, IND.
Specialists in Heavy Duty Floor Treatments

THEY SAY AND DO

Says Efficiency Will Pay in Re-Negotiations

A new incentive to management efficiency is held forth by the War Department Board of Price Adjustment which has announced that plants which initiate economies, especially those which release equipment and manpower for additional production, will receive the greatest consideration in the re-negotiation of war contracts.

This was made plain to a recent gathering of 300 management men of the New York Ordnance District in New York by Maurice Hirsch, chief of the Board's settlement division. He also pointed out that few contractors seem to realize that when a manufacturer's fiscal year has been re-negotiated, he is then given the benefit of all the profit achieved thereafter during that year through special effort on his part to reduce costs. Manufacturers who are aware of this fact, he said, are coming forward in greater numbers to ask for contract re-negotiation instead of waiting for adjustment boards to act.

Hirsch pointed out that the trend to cost reduction would help American private enterprise to hold its own in the stiffly competitive markets of the post-war world. He asserted that the government would find other means of regulation if industry and the contracting agencies cannot work out, through negotiation, a means of obviating really excessive profits.

•

Union Dynamiting Hit by Supreme Court

A union which turns to outright violence may henceforth expect little sympathy if its claims for protection under the Wagner Act get as far as the United States Supreme Court.

The nation's highest tribunal, by a six-to-three vote, recently issued a strong denunciation of the use of dynamite by unions in strikes. The decision arose in a review of a National Labor Relations Board ruling in the case of Local B-9 of the International Brotherhood of Electrical Workers (AFL) against the Indiana and Michigan Electric Company of South Bend. The Supreme Court upheld the Sixth Circuit Court which had held that NLRB should reopen the case following its decision in the union's favor.

Justice Jackson wrote the majority opinion, with Justices Black, Murphy, and Douglas dissenting. Jackson's sharply worded condemnation of the union declared in part:

"The process of presenting cases to the National Labor Relations Board must be kept free from forces generating bias or intimidation. Dynamiting or display of force by either party has no place in the procedures which lead to reasoned judgment. The influence of lawless force directed toward parties or witnesses to proceedings during their pendency, is so sinister and undermining of the process of adjudication itself that no court should regard it with indifference or shelter it from exposure or remedy.

"The remedies of the law are substitutes for violence, not supplements to violence, and it is proper that courts and administrative bodies should so employ their discretion as to dispel any belief that use of dynamite will advance legal remedies."

The record of the case indicates that, on November 24, 1938, the day after the Indiana and Michigan Electric Company had filed its answer to the union's NLRB complaint, the cables of a company substation were dynamited. On five later occasions transmission poles were sawed off and transmission towers were dynamited. Four officers and members of the union later confessed their guilt in the case. Two were convicted and sentenced to prison. Testimony was given that the dynamiters were paid by John R. Marks, assistant business manager of the local, sums of money aggregating $2325 taken from the union treasury.

The three dissenters, in an opinion written by Justice Black, took the view that the misdeeds of the criminals should not be made the basis for depriving innocent members of the union of their collective bargaining rights under the National Labor Relations Act. Said Black:

"A desire to punish dynamiters does not justify a failure to protect respondent's employees, innocent of wrongdoing, in their freedom either to bargain collectively through representatives of their own choosing or to be represented by no one at all."

•

Ideas That Help to Win the War

At a round table discussion of the Industrial Advertising and Marketing Council in December, morale building ideas were exchanged for inclusion in the War Production Drive program.

Among actual stories coming out on stimulating production was a case in the Bassick Manufacturing Company, Bridgeport, Conn. A bid came in from an airplane manufacturer on the west coast wanting a rush order, air express, of 40 items of casters needed to complete a production line. The shipping cost was $2000—word of which was circulated through the plant. It was felt that if the workers knew that 40 casters were so essential to war production that a company would pay $2000 for their shipment alone, they would be convinced of the importance of their job in speeding production.

Another plant took one of Henry

"EVERY WEAPON WE MAKE TODAY IS WORTH TEN WE MIGHT PRODUCE NEXT YEAR"

WRITE TODAY FOR YOUR FREE COPY OF "WARTIME CONSERVATION"

SAVE CRITICAL MATERIALS in selection, application and use of electrical equipment.

USE NEWLY DEVELOPED METHODS to speed war production.

KEEP EQUIPMENT RUNNING by proper Maintenance and Repair Service.

REPLACE CRITICAL MATERIALS with Micarta and Prestite.

SAVE SCRAP by systematic planning and salvage.

Today, America must use all the capacity of its electrical equipment . . . must save the steel and copper it takes to build new apparatus.

On liquid-filled transformer installations, for example, the addition of forced-oil circulation and air-blast cooling will increase capacity 60%. You can get 6.25 horsepower from your 5 horsepower motor . . . save 30% in switchgear negotiation, engineering and production time.

These and other methods of increasing productive capacity and saving Critical Materials are described in the new 100-page Westinghouse book, "Wartime Conservation." Westinghouse Electric & Mfg. Company, Dept. 7-N, East Pittsburgh, Pa.

J-90469

Westinghouse

PLANTS IN 25 CITIES ... OFFICES EVERYWHERE

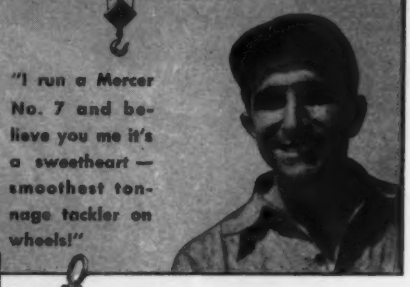
"THE NAME THAT CARRIES WEIGHT"

MERCER

MATERIAL HANDLING EQUIPMENT

ASK THE MEN WHO HANDLE 'EM!

"I run a Mercer No. 7 and believe you me it's a sweetheart — smoothest tonnage tackler on wheels!"



MERCER WHEEL-TRACTOR CRANES make light work of heavy loads... Available in 3 ton, 5 ton and 7 ton capacities. Gasoline-powered. One man operation. Special catalog describes complete line. Write for copy today. ★ Check Mercer first, too, on your TRAILER TRUCK requirements. All types. Capacities from 2 to 35 ton. Literature available.

MERCER ENGINEERING WORKS, INC.
30 CHURCH STREET, NEW YORK, N. Y.
Works: Clifton (Allwood), N. J.

STEP UP EFFICIENCY
with
Filtrine
FILTERS

They give that extra touch of PURITY to drinking water . . . of FINISH to water used for industrial purposes. FILTRINE FILTERS remove *completely* all rust, sand, clay, vegetable and other suspended matter which clog industrial mechanism and impair employee health. They are a CHEAP investment because they last a lifetime. The filtering element may be replaced in a matter of minutes so you're never without their valuable aid. Capacities range from 2 to 100 gallons, and models are equally varied. Use FILTRINE Storage Type COOLERS, too, to insure a constant supply of cooled water. Self-contained coolers, remote type coolers for drinking water and coolers for general industrial use are available in a variety of models. Install FILTRINE and keep pace with today's tempo.

Write today for further information.

Filtrine
MANUFACTURING COMPANY
53 Lexington Ave., Brooklyn, N.Y.

RODNEY HUNT
Super-Strong
ROLLS

PATENTED
"SHAF-TITE"
CONSTRUCTION

Write for Catalog!

RODNEY HUNT
MACHINE COMPANY
22 Maple Street, Orange, Mass., U.S.A.

Kaiser's now famous expediters on tour through the shop, letting him talk with the workers on the bench. The effect was better than a dozen pep talks.

Another suggestion that made sense to the executives was to furnish foremen with pictures showing application toward the war effort of products made in their departments. This ties in the foremen and gets the information to the men in the department.

•

Anti-Labor Measures Will Be Fought by AFL

In a resolution, adopted by the executive council of AFL, addressed to Vice-President Wallace, Speaker Rayburn, and the majority and minority leaders of both Houses of Congress, William Green, AFL president, urged these men "to exert constructive leadership to prevent the enactment of dangerous and foolhardy anti-labor measures now being proposed in Congress."

He referred specifically to bills which would make strikes and the closed shop illegal, provide federal supervision and control of labor unions, and repeal the 40-hour week. "These bills would destroy the basic freedoms of American workers, impair standards, and handcuff the efforts of loyal trade unions to expedite the war production program," the resolution states.

"Even in normal times AFL is opposed to strikes except as a last resort to remedy injustice," it continues. "In the present war crisis we are opposed to strikes for any cause. But we will fight to the limit of our strength to preserve the right to strike, which is just as fundamental a democratic freedom as the right of free speech and free press. . . .

"We oppose impairment of the 40-hour week standard for overtime compensation because it would not add a single hour of work in war production and would result only in a pay cut for our loyal production soldiers. . .

"We also urge you to consider the dangerous effects of legislation aimed at strangling our trade union organizations. These unions have cooperated fully with the government during the war crisis and have solved many manpower and operational problems which threatened to impede the war effort. . . . We appeal to you to let our trade unions continue to give constructive service to the nation, unhampered by restrictive legislation."

•

Industry Leaders Issue Post-War Challenge

With "collectivism by default" as the alternative, a group of industry's own most important leaders has challenged private enterprise to get busy now on plans for post-war employment.

The first act of the new Committee on Economic Development, recently

Star-Spangled RATIONING

In wartime we expect our fighters to have better guns for knocking off Nazis than we keep around home for knocking off squirrels.

In wartime we are glad to use our cars a lot less so the boys in Africa and Australia can use their tanks and planes a lot more.

In wartime we are proud to turn over our factories to build products that fight, instead of the things of peace.

In wartime we are happy to buy bonds that help carry something more than moral support around Murmansk way.

But how far personally are we really willing to go to help win the war?

There are men who hid hundreds of gallons of gasoline in their basements before rationing.

There are women who tucked their closets full of sugar before the lid went on.

There are people who wore themselves footsore buying up coffee before it was restricted.

These folks perhaps have no sons in the Solomons, or husbands, brothers or relatives in Africa.

They perhaps feel only the cold wind on their necks when they uncover for the Star-Spangled Banner.

They for sure are in the minority—there just can't possibly be more than one American worm to every thousand American patriots. As makers for years of essential parts for automobiles and airplanes as well as products for home and farm, we believe the way Americans are wearing their "A" cards indicates the spirit with which they will meet all other forms of wartime sharing and rationing.

We believe the true American breadwinners and housewives and their thinking children—and there are 130 million of them—see the advantage of all Americans at home sharing alike—see the need of first providing adequate food and supplies for fighting forces and fighting allies.

★ ★ ★

We believe if there isn't as much food or gasoline or clothes to permit everyone to have as much as he wants, the supplies that are available should be divided as equally as possible so that all may have a fair share.

We believe rationing should be maintained only as long as these wartime needs are present.

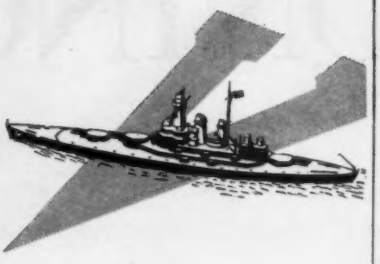
We believe rationing in wartime is not regimentation

—it is merely applying the Golden Rule clear across the board in a good cause.

BORG-WARNER CORPORATION, *Chicago*

Makers of precision products . . .
on the road, in the sky, on the farm, in the home

Metal Shapes—
THE SPEARHEAD OF VICTORY



It takes parts by the thousands, of all kinds and shapes, to make up a "battle-wagon" and its equipment. Our job now is to make such parts for America's war machines . . . and we're at that job 100%.

When Victory comes and we return to work for industry's peacetime needs, lessons learned in war production will yield liberal dividends in new skills, new methods and new materials . . . and in these dividends, RITCO's peacetime customers will generously share.

SPECIAL BOLTS, NUTS, and STUDS
DROP FORGING and DIE SINKING
SCREW MACHINE PRODUCTS
HEAT TREATING
SPRAYED METAL SERVICE

Estimates gladly submitted. Send samples or blueprints. Catalog on request.

RHODE ISLAND TOOL COMPANY
148 West River St.
Providence, R.I.

Serving American Industry Since 1834

RITCO

named by Secretary of Commerce Jones, was to take the measurements of the post-war reemployment task and announce its findings. The result is staggering. The Committee found that, within two years following the end of the war, private employers will have to provide 9,000,000 more jobs than in 1940, and increase the national output of goods as much as 50 percent above the level of the last pre-war year.

This conclusion came not from a group of economic theorists, and certainly not from the school of thought which holds that vast public works and the socialization of industry will provide the only answer to the post-war problem but from a group of practical industrial management men headed by Paul G. Hoffman, president of the Studebaker Corporation.

Other members of the Committee of 18 include Clarence Francis, president of General Foods, Charles R. Hook, president of the American Rolling Mill Company, Charles F. Kettering, vice-president of General Motors, and Harrison Jones, chairman of the Coca Cola Company. The Committee, while named by Secretary Jones, is independent of the government and is organized on a non-profit basis with a staff in Washington and a field development committee headed by Marion Folsom, treasurer of Eastman Kodak; a finance committee, headed by Clarence Francis; and a research committee under the chairmanship of Ralph E. Flanders of Jones & Lamson Machinery Company. The committee's first objective is to organize on a national basis and thus to assist businessmen and industrialists in every city to begin working out their post-war production and marketing plans.

"The unrealistic people in our country today are those who think we can go back to having 10,000,000 to 15,000,000 people unemployed and remain a free country," Chairman Hoffman declared at the Committee's first press conference. "We'll have collectivism by default unless we take steps now to solve the problem of unemployment."

Another Viewpoint

An international policy of "enlightened selfishness" plus a functioning system of free enterprise in the United States are advocated by Robert R. Wason, president of Manning, Maxwell & Moore, Inc., for post-war security.

In a recent address before Young Men's and Young Women's Hebrew Lyceum, Elizabeth, N. J., he outlined his plan for a better economic set-up after the war.

Feeling that our effective leadership in world reconstruction depends on our solvency and military security, he pointed out that weakening our strength by disarmament or excessive debt should be avoided.

Turning to the economic prospect, he continued, "If the free enterprise system is restored, jobs and prosperity will be available for all our people."

Pointing out that 5,000,000 of our soldiers and 2,000,000 sailors will be seeing firsthand the living conditions of other nations and studying the economic situation of their people, Wason believes

FOR
Victory
Help from you and me in '43

We've opened the second front . . .

We've taken the first steps toward Tokio . . .

But our BIGGEST job is ahead!

We're already buying War Savings Bonds.

Let's keep on buying . . .

But there's much *more* to be done.

Uncle Sam needs our $$$$ *strong!*

ALL TOGETHER NOW

Let everyone invest every available dollar in the front line.

There's no finer investment. These dollars are our most vital SECURITIES!

Go to your bank, broker, investment dealer, or wherever you make investments, and . . .

INVEST IN UNITED STATES TREASURY TAX SAVINGS NOTES AND UNITED STATES SAVINGS BONDS

ESTABLISHED 1873
S. G. TAYLOR CHAIN CO.
P. O. Box 509FM Hammond, Indiana

When you're mass-producing bombers

you can't slow down for Painting!

DeVilbiss designs and builds a gigantic spray booth to speed the painting of Martin Bombers

● If we're to sink the Rising Sun, if we're to drive Hitler and his horde from Western Europe, we must mass-produce *all* war materials—including bombers. And we are! At the Glenn L. Martin Company, for instance, the now-famous Martin bombers are being produced at a rate never before dreamed possible.

These huge war birds are, of course, painted by the modern, high-speed spray process—but the ventilation of such an enormous spraying area created a problem. So Martin came to DeVilbiss for the solution.

DeVilbiss engineers designed this efficient 15,200 square foot water wash spray booth to provide the uniform, effective movement of air required for ideal working conditions. It's large enough to accommodate Martin's biggest bombers, wings and all. With its motor driven accordion doors extended it is divided into four sections through which the giant fuselages rapidly move as they receive their interior and exterior spray finish in mass production style.

If *you* are building planes, ships, tanks, camps or factories, making weapons or munitions, applying blackout or camouflage—in fact, *whatever* your war job . . . you can count on DeVilbiss for the time-saving answer to any coating, painting or finishing problem.

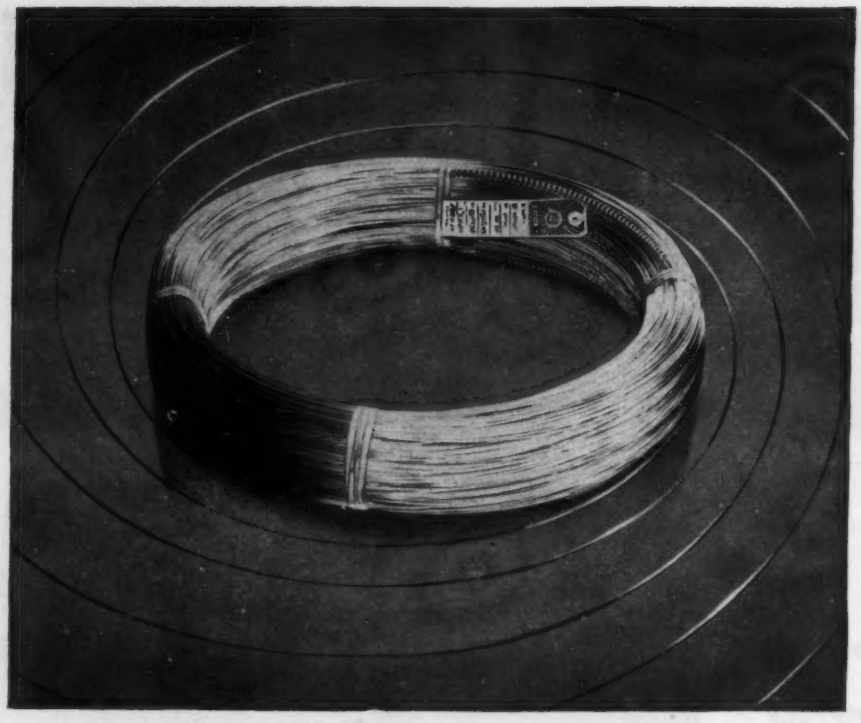
THE DEVILBISS COMPANY • Toledo, Ohio

Canadian Plant: WINDSOR, ONTARIO

● ● ●

THE COMPLETE DEVILBISS LINE CONSISTS OF: Spray finishing equipment • Automatic coating machines • Tanks for spray materials Spray booths and exhaust fans for vapor and dust elimination Air regulators, cleaners and dusters • Air compressors • Respirators Specialized hose for paint, air, water, gasoline, welding and pneumatic tools • Hose connections • Water and oil guns • Equipment to prevent offset in printing • Paint stripers • Medicinal atomizers.

DEVILBISS
SPRAY SYSTEMS



MUSIC WIRE Conforming to Government specifications (WD 1085-WD 1095) Stock sizes .004" to .180" dia.

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WORCESTER ★ MASSACHUSETTS
NEW YORK AKRON LOS ANGELES

GET EXTRA
PUNCH
OUT OF
SKILLED
HANDS!
Keep skilled hands flexible and productive with PAX Granulated Industrial Skin Cleanser. PAX will not "dry out" hands because . . .
1. pH below 10
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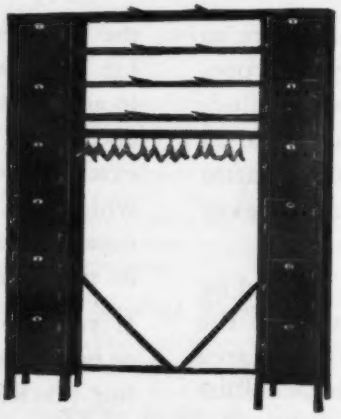


New "Wood" Locker Racks
Accommodate 12 in floor space of 5 ordinary lockers

The new hardboard and plywood Peterson Industrial Lockers come in both single and double (back-to-back) units that accommodate either *12* or *24* persons in every 5 running feet. Double locker room capacity and save valuable floor space for productive use. Provide each employee with a spaced coat hanger, an individualized ventilated hat shelf and a 12 in. x 12 in. x 12 in. lock box for lunch, micrometers, drawing instruments or personal effects. Keep wraps "in press" dry and sanitary—exposed to air and light. No crumpled hats or soggy lunches in stormy weather. Prompt delivery.

Write for circular.

VOGEL-PETERSON CO.
"The Checkroom People"
1841 N. Wolcott Ave. Chicago, U. S. A.

these men will come back with a full appreciation of the forward movement of free enterprise. "These men will demand the end of all plans that dissipate present resources and create no new resources. . . . (They) will demand that free enterprise be permitted to operate without limitation or restraint other than the public good. They will know that the competitive enterprise system corrects its own error of product and price, that it pays for its own mistakes in the struggle of one business against another to improve service or convenience or utility to the public at large," he declared.

As a summary of his observation for the post-war need of freedom in economic functions, he stated, "What industry proposes is jobs for all who want them; a higher standard of living than we had before the war; restoration of freedom for individuals—the same freedom for which we are fighting; a prosperous business, labor, and agriculture to provide new and better goods, the making of which will attract investment of savings now withheld; sound money we can trust, without which people will neither save, invest, nor take out insurance for the years ahead.

"In the post-war period, if laws are not changed so that industry and commerce as well as labor and agriculture can make a profit, then the government will continue its 10-year failure to make jobs while it distributes poverty among us."

Manufacturers Plan Cooperation

With cooperation among manufacturers as a keynote, a two-day meeting of representatives of leading industries was held recently at Syracuse, N. Y. on post-war planning. Carrier Corporation sponsored the conference.

J. M. Bickel, head of the Carrier planning group, began the session with the opening statement: "American industry has made a convincing demonstration of fundamental soundness in its fulfillment of the boundless requirements of the victory program. Industry must make definite plans now if it is going to be equally successful in maintaining employment and the flow of essential goods after the war."

Subjects discussed included postwar employment, production, marketing, and distribution. The period between the two World Wars was reviewed. Also considered were availability of market data, selling post-war goods, furthering free enterprise, and peacetime economic effects of demobilization and providing food, shelter, and clothes abroad and at home.

First get-together since the war started of a group representing so many different business interests, planners attended from General Electric Company, Schenectady; National Cash Register Company, Dayton; Servel, Inc., Evansville, Ind.; Sylvania Company, New York; Weyerhauser Sales Company, St. Paul; Studebaker Corporation, South Bend; Eastman Kodak Company, Rochester; Monsanto Chemical Company, St. Louis; Revere Copper & Brass Company, Rome, N. Y.; Ferguson-Sherman Manufacturing Company, Dearborn, Mich.; American Rolling Mills, Middletown, Ohio; Graybar

CUTS TIME ON MANY OPERATIONS 50% TO 80%!

Revolutionary NEW

PORTER-CABLE

Wet-Belt SURFACER

Now—a series of six interrupted surfaces uniformly faced to micro-flatness—all at the same time—and all in a matter of seconds. ***Operation done 10 times faster!***

And that's just *one* of the ways this revolutionary new PORTER-CABLE WET-BELT SURFACER is speeding production, smashing bottlenecks, and taking over many operations from work-jammed millers, shapers, grinders, and lathes.

In famous aircraft plants . . . in precision instrument shops and toolrooms . . . in scores of production-line armament factories . . . this versatile tool has achieved astounding economies in time and labor. It has shown hard-headed practical foremen and production engineers that there is a new, short-cut, precision machining method; a simple, easy way that unskilled operators can learn in no time.

Sure, it can help you. Its fast-cutting, diamond-hard abrasive belt—traveling at high speed—produces true, uniform, highly-polished surfaces, either flat or curved, to limits of .0005" if desired. And the Wet-Belt eliminates hazard of heating, discoloring, warping, dust . . . safely handles inflammables. All done in a matter of seconds. You owe it to yourself, to your plant, and to the war effort to investigate this new Porter-Cable G-8 Surfacer. Find out the many applications which will save you time and effort and speed your production.

SEND NOW for a free copy of our new booklet, detailing applications of Porter-Cable Wet-Belt Surfacers to war production work.

PORTER-CABLE Machines That Do Hard Jobs the Quick, Easy Way

Ease, speed, simplicity, durability . . . those four factors have been uppermost in all Porter-Cable developments. They're characteristic of the six Porter-Cable tools shown here. Tools that have won the enthusiastic approval of good workmen everywhere! Write for literature.

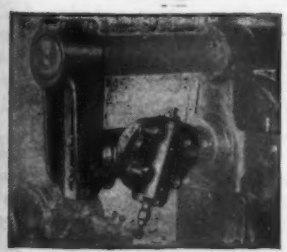
TAKE-ABOUT SANDER
Sturdy, powerful, easy to use. 100% ball-bearing—with clean dust pickup.

SPEEDMATIC SAW
Helical-gear drive for efficient, smooth power and long-life. Perfect balance for one-hand operation.

CHAIN DRIVE 7" SHAPER
Precision—ease of operation—high cutting speed without vibration.

DISC SANDER
Direct-drive, ball-bearing motor. Table tilts, lowers.

SPEEDMATIC FLOOR SANDERS
Fast, clean, powerful operation. Unusual handling ease.



UNIVERSAL MILLING MACHINE ATTACHMENT
Adds to operations done on power and hand-feed millers; reduces set-ups.

PORTER-CABLE MACHINE CO.

2150-2 N. Salina St., Syracuse, N. Y.

PRECISION MACHINERY BUILDERS SINCE 1906

For the Emergency..

AND A LONG TIME AFTER!

INDUSTRIAL BUILDINGS
and PLANT ADDITIONS
DESIGNED, FABRICATED AND ERECTED
BY . . .

PITTSBURGH
•DES MOINES

Furnished under one contract, one responsibility—on schedules of pressing urgency—these typical examples of recent Pittsburgh-Des Moines construction are *built to endure*. The complete facilities of this organization, as experienced building contractors in the industrial field, are at your service—with satisfaction guaranteed!

PITTSBURGH-DES MOINES STEEL CO.
PITTSBURGH, PA. 3458 NEVILLE ISLAND—DES MOINES, IA. 959 TUTTLE ST.
NEW YORK, ROOM 944, 270 BROADWAY . . . CHICAGO, 1262 FIRST NATIONAL BANK BUILDING
DALLAS, 1263 PRAETORIAN BUILDING . . . SAN FRANCISCO, 665 RIALTO BUILDING
SEATTLE, 1166 EIGHTH AVE., SOUTH

Electric Company, New York; Curtis Publishing Company, Philadelphia; Aluminum Company of America, Pittsburgh; Curtiss-Wright Company, Buffalo; and Washington D. C. Department of Commerce.

•

Industry's Achievements Highlighted by Nelson

No false optimist, War Production Board Chairman Donald Nelson nevertheless believes that when the nation's industry rolls up a record of vast achievement, the people should know of and take pride in it.

For this reason he told the Poor Richard Club of Philadelphia recently that in ordinary times "it would take us 10 years to do what we are doing in one year."

"We are discovering that our America is just about twice as strong, twice as capable, and twice as productive as we ever before imagined," Nelson declared. "We are proving, in the shop, in the forge, and in the factory, that there is no physical achievement which may be desirable that is impossible to us. We can do, as a people, anything—literally anything—that we want to do.

"We have done more than we dared hope we could do a year ago. Without giving way to excessive optimism or overconfidence, we can say that every American ought to recognize that the job that has been accomplished by this nation in this war is without parallel in history. We have proved that democracy is not dead, and that, when once aroused, it can do the impossible.

"It may be that years of greater effort than we have yet made are ahead of us. Nevertheless the people of this country are entitled to feel a sober pride in the way they have met the task which was given them after Pearl Harbor."

Production Details

Nelson spoke almost on the anniversary of his appointment to the WPB chairmanship. The details of the really colossal results of America's first big year in the battle of production had been announced only a few days earlier by President Roosevelt in his "state of the nation" address to the first joint session of the 77th Congress. Referring to the production front, the President had declared:

"We have been achieving a miracle of production. We produced 8000 military planes, 56,000 combat vehicles, 670,000 machine guns, 21,000 anti-tank guns, 10,250,000,000 rounds of small arms ammunition, 181,000,000 rounds of artillery ammunition, and above 8,000,000 tons of merchant shipping."

War on such a scale costs money, however, as the President reminded Congress a few days later in the message which he inclosed with the most staggering budget in the history of this or any nation. For the fiscal year beginning July 1, 1943, he estimated the United States would spend $108 billions for war purposes alone—well over twice as much as all

IN HOCKEY, player substitutions help to "pep up" the team. In Whiting Victory Cranes substitute construction overcomes critical shortages due to the war... with engineering control to assure equal or improved performance.

Specify WHITING *Victory* CRANES

America has a job to do... and the best brains and resources of the nation are bending to the task. The urgent need for cranes is being met by a combination of engineering skill and expediency.

When various parts or methods of construction are threatened with delay, Whiting Victory Cranes are fabricated with equivalent parts or methods under the direction of competent crane engineers. Thus Whiting Victory Cranes keep going out on schedule... cranes fully guaranteed to measure up to Whiting standards of performance, durability, and quiet operation. Whiting Corporation, 15689 Lathrop Ave., Harvey, Illinois.

BUILDERS OF QUALITY CRANES FOR NEARLY 60 YEARS

New Handbook for crane operators contains instructions for guidance of operators, hookers-on, repairmen, and others. Copies on request.

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AGENTS IN OTHER PRINCIPAL CITIES.

GUNS and TANKS
THAT FIGHT AT HOME

Paasche WEAPONS OF INDUSTRY SPEED
FINISHING OF WEAPONS FOR WAR

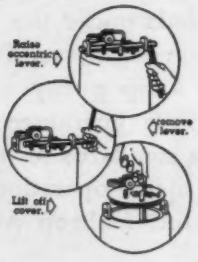
To win the battle of production, every minute must be made to count. Are you doing it? Have you taken full advantage of the valuable time and labor-saving features that Paasche Airpainting Equipment offers? Put it to work and you **increase efficiency—save man hours—improve quality and step up production.** This is being proved every day!

Arm your finishing department with equipment that's Tailor-made for War Production. Whether it be an automatic unit—a new water wash booth—or the guns and tanks shown below—you will find a Paasche Product for the job and Paasche Engineers at your service.

"EASIER TO HANDLE"—That's what finishing men say about the Paasche C.U.B. High Production Airbrush. Its 22 ounces of perfectly balanced weight nestle in the hand—and enable operator to work at highest efficiency for long hours. That distinctive design means fewer replacements. Its simple construction is especially desirable for "green hands". It sprays all types of finishing material at top speed under perfect control. This is the gun for your Finishing Department. It's described in detail in Bulletin FM9-42.

5 SECONDS AND THE COVER'S OFF

Raise the lever—slip out—and you remove the Clamp-tight Cover of this Paasche Pressure Feed Material Tank. No knuckle busting wrenches are needed, nothing to lose. Cover assembly equipped with new pressure locking regulator. Here's another Paasche Time Saver that you need NOW!



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AIRPAINTING EQUIPMENT

the other United Nations combined and more than the total of all the other United Nations *plus* the Axis.

In fact, this estimated cost of one year of war is equal to the total cost of the United States government for all purposes, in war and peace, in all the first 143 years of the Republic's existence from 1789 to 1933.

•

CIO Program Aims at Total Mobilization

"It is the task of organized labor to present a program of action to the American people which will accomplish what they so earnestly desire—immediate and decisive victory." So says Philip Murray, president of CIO, in the preface to a Victory Program proposed by his organization for 1943.

Divided into eleven sections, the entire program aims to help achieve an immediate total mobilization of the resources of the United Nations, according to the preface of the program.

"Unity Among the United Nations," Section 1, points out that a small group of appeasers and defeatists seek to tear down our national policy by sniping at the lend-lease program and the efforts of this nation to supply necessities to other peoples of the United Nations. "The CIO pledges its complete support to our Commander-in-Chief in his efforts to forge an indestructible United Nations . . . our support to all measures for the furnishing of military and other supplies to the various members of the United Nations so that the fullest world-wide mobilization of economic and human resources can be achieved in our offensive against the Fascist aggressors."

Section II, "Total Mobilization," states "this nation has not as yet achieved complete and total mobilization of all its resources . . . the problems of production are still divorced from the problems of manpower and economic stabilization. The CIO is opposed to so-called 'national service legislation' or to attacks upon statutory and contract provisions for adequate payment for work done beyond 40 hours in a week. . . . The CIO pledges its effort to attain a national mobilization based upon a nation-wide planning and utilization of all the material and manpower resources of the nation. A single civilian administrative body must be established incorporating the activities of war supply, war manpower, and of economic stabilization. . . . Such total mobilization cannot operate without labor and therefore must be organized with the direct and fullest participation of labor."

In Section III, "Price Control and Over-All Rationing," the program pledges CIO's support of price-ceiling and rationing proposals. It is emphatic in its demands for an immediate over-all rationing of all foods and other necessities; and effective enforcement of price ceilings; introduction of representatives of labor organizations in local and state bodies which have control of price fixing and rationing; a sufficient appropriation for

Small—BUT VITAL

Tips
ON BEARING CARE
To make present equipment last longer
1. Use clean lubricant recommended by the manufacturer of this machine.
2. Avoid loads and speeds beyond those recommended by the manufacturer.
3. Check wiring and insulation frequently. Short circuits or stray currents can damage bearings.
4. If necessary to remove bearings, keep them properly lubricated. Avoid the intrusion of water and dirt. Apply pressure on the inner race only. Don't hammer outer race.

• *Built by* VICTOR R. BROWNING & CO., INC.

Bearings represent only a *small* part of a machine, but they represent a TREMENDOUS part of its performance. A glance at this picture will show you that. For here's a long lineshaft that must be properly aligned at all times. Note the sturdy SKF Pillow Blocks all the way down the line. Their split construction makes them easy to install, inspect and disassemble. That's why SKF Bearings on so many well-designed machines today are mounted on SKF Pillow Blocks. 5220

ARMY E NAVY

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BALL AND ROLLER BEARINGS

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PRECISION
Metal Spinnings and Stampings

We've been "gittin' thar fustest with the mostest" for a long time in such fields as aircraft instruments, scientific apparatus, radio, motor and electrical, although we've handled everything from clock bezels to mixing bowls in the miscellaneous groups.

ENLARGED PLANT FACILITIES to handle all sizes, all metals and all shapes of Metal Spinnings, Metal Stampings, Deep Drawings, Power Brake Work, Spotwelding, Metal Finishing and Assembly Work.

Maybe parts you're now using be spun or stamped . . . faster, better, and at a saving in cost. Consult with us. If it can be done we'll help you do it!

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Permanently protects metal against rust and corrosion, thus prolonging life of pipes, tanks, etc. Forms a moisture-proof, insulation type coating impervious to acid and alkali.

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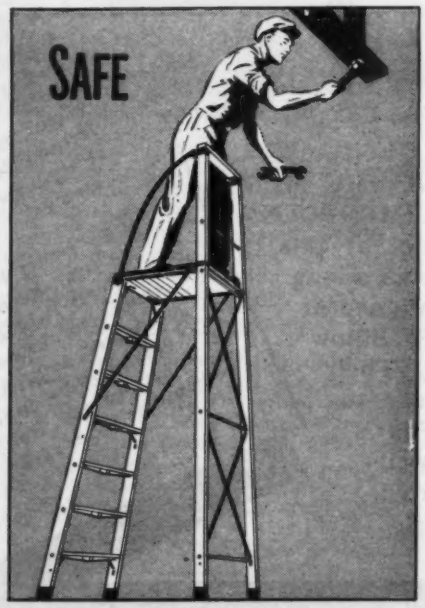

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the OPM to permit it to tackle the questions of price control and rationing; replacement of present complicated price ceilings with a simple system of fixed cash levels for all basic foods.

"The CIO program seeks to assure all people that they will have sufficient money to permit them to buy the necessities of life," continues the program in Section IV, "1943 Tax Program." Toward this end, these suggestions are made: "Absolute opposition to any sales tax; complete elimination of all war profiteers; elimination of all unjust and special privileges."

Freedom From Want

Section V, "Social Security Program," says: "The needs and problems of the war emphasize the necessity for an expansion of the social security program. *We must now establish the basis for attaining freedom from want.* This program must include provision for (a) a single federal system of old-age insurance with equivalent coverage for all the aged people, including the presently exempt groups; (b) a single federal system of unemployment compensation with extended coverage to all workers; (c) adequate provision for workers who lose their earning ability through total and permanent disability; (d) adequate provision to workers for losses due to illness; (e) a national health program which would include insurance for medical care on a federal basis; (f) adequate provision for the protection of the rights of men in the armed forces, particularly with a view to the situation that may face them on their return."

Section VI deals with Dies Committee and in Section VII, CIO pledges itself to an all-out drive to secure the early enactment of the poll-tax bill.

Dealing, in Section VIII, with the National War Labor Board, CIO states that it is opposed to any legislation which seeks the elimination of or interference with the Board as an effective aid to collective bargaining. "However," it continues, "organized labor will continue to insist upon the streamlining of the procedure of the Board so as to assure a prompt and expeditious disposition of the grievances of wage earners arising in industry. . . . Further, CIO will seek to impress the Board with necessity for meeting the needs of war production through the upward adjustment of wage levels, to assure the maximum efficiency of war workers through adequate food, clothing, and medical budgets. . . . Finally, the Board must not pursue any policy which results in developing or widening differentials against the low income wage earners."

Sections IX, X, and XI discuss government employees, pointing out that CIO will seek to obtain improvement in their wages and working conditions; farmers and farm workers, for whom CIO pledges its support of a program which seeks to assure adequate food supplies for the United Nations by an immediate war conversion and expansion for American agriculture; and anti-labor legislation, which CIO pledges to oppose firmly, as a measure calculated to disrupt and disunite the American people.

Increased Production with

Gulf Cutting Oils

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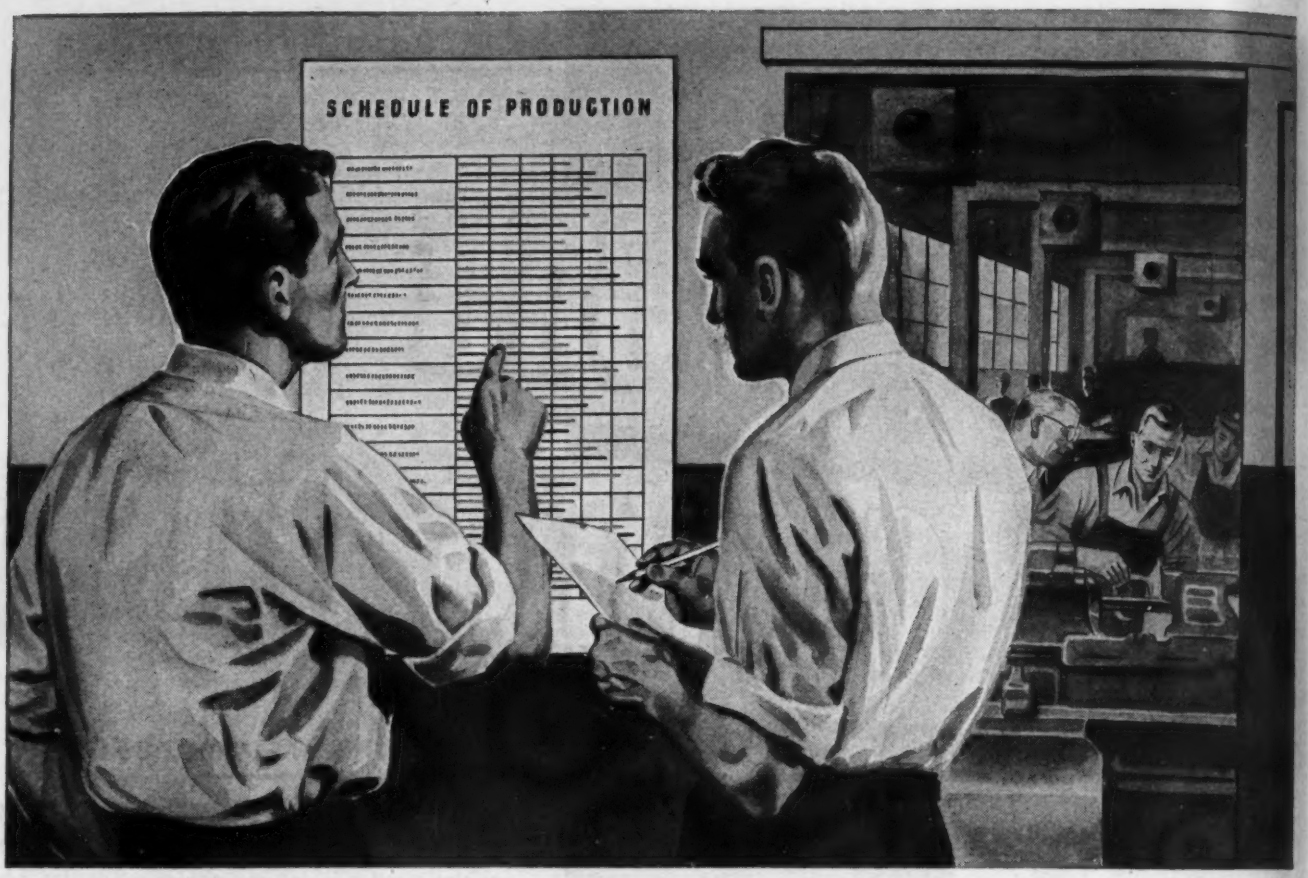

In plants where minutes count you can count on RCA Sound Systems

Time is a weapon in this war. No plant, no production center, can afford to waste time—any more than it can waste critical materials, machines, or power.

RCA Industrial Sound Systems are time-savers that are proving themselves again and again to American industry working at full speed for war.

Because they are installed to meet the specific needs, to cope with the specific problems of each plant, RCA Industrial Sound Systems do exactly what is required to speed production and step-up efficiency. Instant instructions can be issued to the entire personnel, or to just those groups it is desired to reach. Bulletins, flashes, important messages race to the farthest corner of the plant—and are heard as clearly as if the staff were gathered in the Manager's office. Individuals can be paged immediately, wherever they happen to be at the moment.

What's more, by broadcasting selected music or war news to the workers during "fatigue periods"—the most important time of all can be saved, *production time*. For when monotony and fatigue is relieved, workers waste less time, increase their output, and even improve the quality of their work.

An RCA Industrial Communication System, tailored to suit *your* needs, can aid in increasing and improving your war output.

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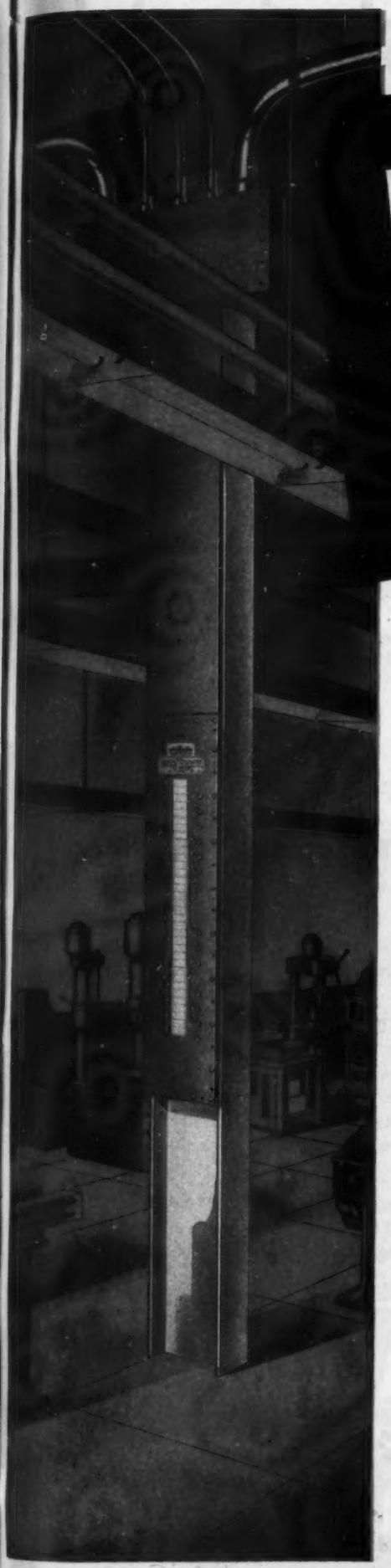

Dust-laden atmospheres spell DANGER!

Every safe-guard must be used to prevent arcs that might set off explosions. Therefore many plants have installed

FA DUST-TIGHT PANELBOARDS

as a precautionary measure . . . Underwriters' Laboratories, Inc., have approved these panelboards for "Class II, Groups F and G, Hazardous Locations," covering atmospheres containing carbon black, coal or coke dust and grain dust . . . They are ideal safety equipment in shell-loading plants, coal mines, coal processing plants, grain mills and other plants troubled with dust-laden atmospheres.

Instead of the usual steel front, consisting of trim and door, this panelboard has a solid steel front plate, gasketed all 'round, and secured with screws to the extra wide flange. It is further rendered dust-tight with welded hubs for conduit outlets, welded box-corners, and handle bushings riveted directly to the steel cover plate. The brackets are welded at the back.

The circuits are externally operable by a mechanism of new FA design. The handles operate through the dust-tight bushings, and engage the regular handles on the circuit breakers inside the cabinet. ON and OFF positions are indicated on the front of the cabinet.

The FA Dust-tight Panelboard may be had in standard type, or in narrow column type (as illustrated). It is of the circuit breaker type, with either FA Type AC or FA Dublbrak circuit breakers, or other types of lighting branch-circuit circuit breakers . . . Capacities: 50 Amperes or less, for 3 wire, single phase, or 4 wire, 3 phase mains, with lugs only. Available with 4 to 42 circuits . . . Frank Adam Electric Company, St. Louis, Missouri.

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ELECTRICAL PRODUCTS

for War Industry

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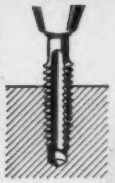
Question every fastening job

CAN YOU...



Eliminate Tapping Operations ?

Avoid Slow Bolt, Nut, and Washer Assemblies ?

Avoid Riveting and Welding in Hard-to-Reach Places ?

Eliminate Inserts in Plastics ?

Call in a P-K Assembly Engineer

to check over fastening jobs with you. He can help you search out *all* opportunities to apply P-K Self-tapping Screws. And, he'll recommend them only when they'll do the job better and faster. If you prefer, mail in assembly details for recommendations.

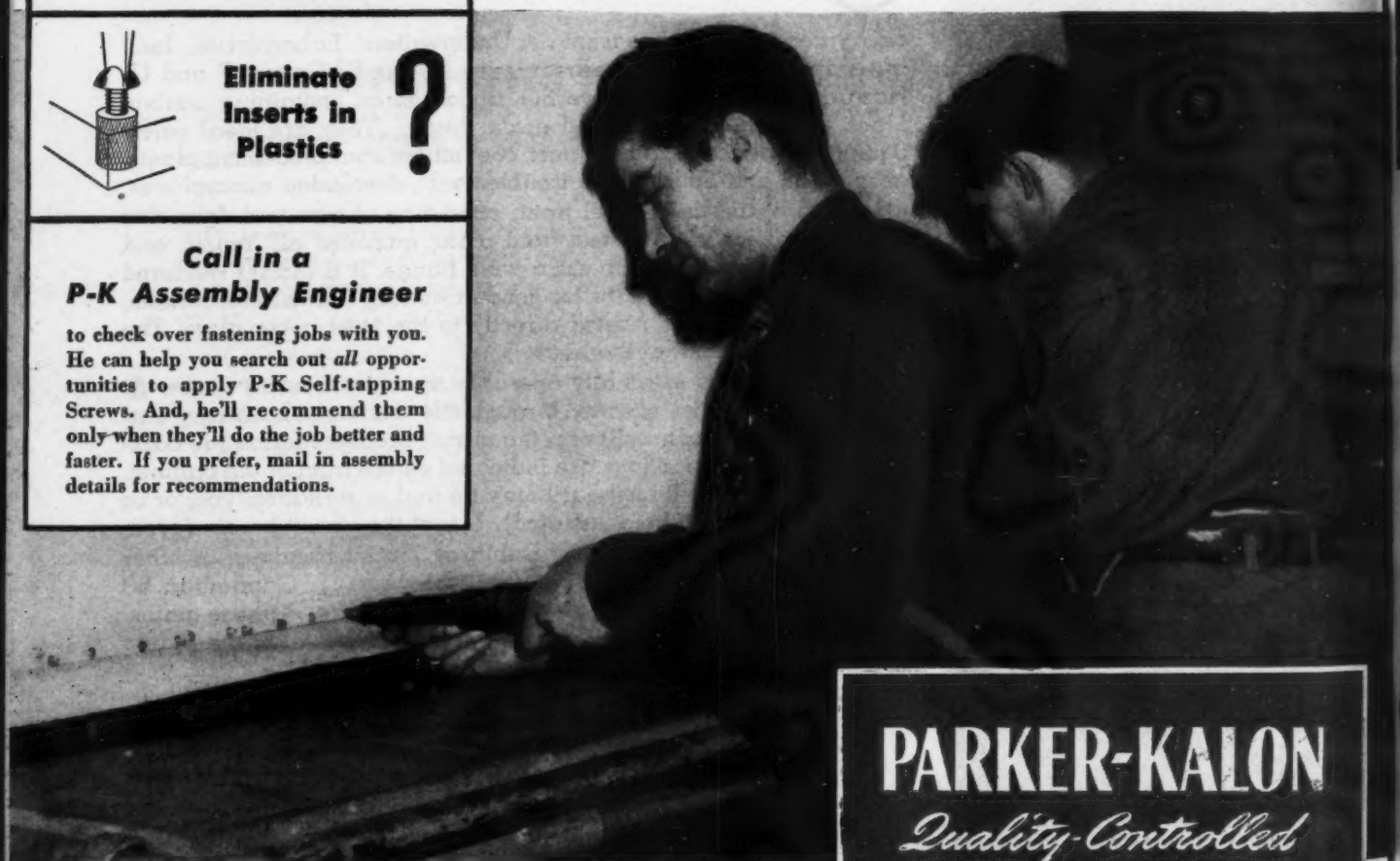
War Production needs *all* the work-hours P-K Self-tapping Screws can save

With the increasing man-power shortage, every fastening job in your plant should be suspect until you've proved beyond a doubt that it's being done by the fastest and best method possible.

Since P-K Self-tapping Screws provide greater ease, speed, and security *for a large percentage* of metal and plastic assemblies, the saving in time is of vital importance in meeting today's demand for peak production.

A Fastening Complete in One Easy Operation . . . You simply drive P-K Self-tapping Screws into plain, untapped holes. When they replace machine screws, you eliminate tapping, tap maintenance, and the problem of procuring scarce taps. When they replace bolts, you save the time consumed inserting bolts, placing washers, and running nuts. When they replace riveting and welding, expensive equipment is no longer required. When used in plastics, they end the need for costly inserts.

Change to Self-tapping Screws Overnight . . . You can make the changeover to P-K Screws with no interruption in production. No special tools or skilled help are required. Whether you are working with light or heavy steel, cast iron, aluminum, brass, or plastics . . . salvage those lost work-hours . . . question every fastening, *now!* Parker-Kalon Corp., 196-200 Varick Street, New York, N. Y.



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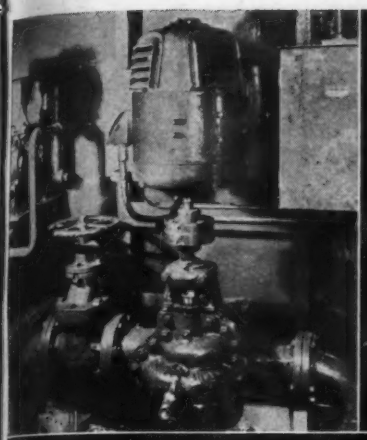
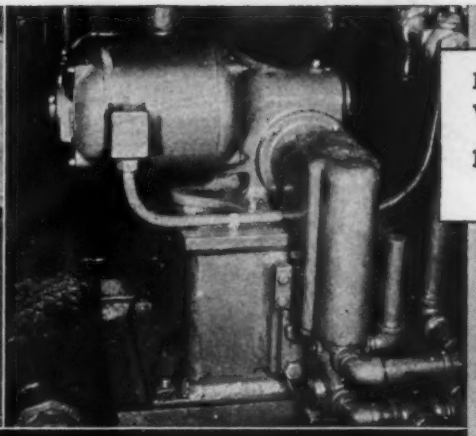
Quality-Controlled

SELF-TAPPING SCREWS

Give the Green Light • to War Assemblies

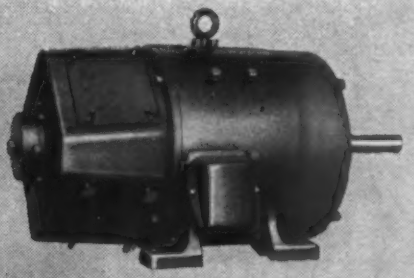




Extreme Left—Century 7½ horsepower, vertical mounted, direct current, drip proof water pump motor.
Left — Century ½ horsepower motor driving a Diesel oil pump.

CENTURY MOTORS and GENERATORS

For the Toughest Sea-Going Service Meet the Rigid War Requirements of Naval and Merchant Marine Applications



7½ horsepower, direct current, ball bearing, fabricated steel, water proof Navy motor.

Century 2 horsepower squirrel cage fabricated steel motor with cast steel end brackets.

Century shipboard motors and generators are built to stand up under

- The toughest sea-going service
- The shocks of gunfire and bombing
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They meet Navy Specifications 17M10 and 17M17, A.I.E.E., recommended practice on shipboard No. 45, and the Maritime Rules of Shipping.

Century Motors' famous ability to "keep a-running" is daily being demonstrated and thoroughly proven on the high seas in applications such as those mentioned above.

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One of the Largest Exclusive Motor and Generator Manufacturers in the World.

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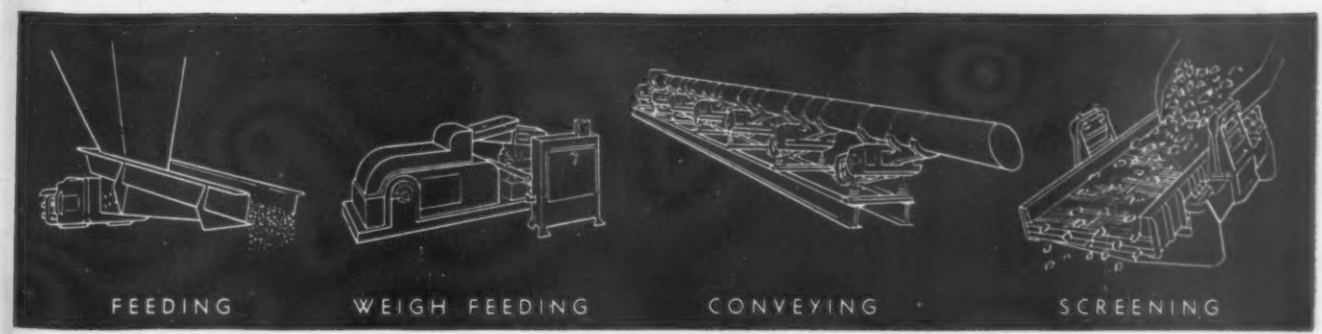

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LIKE GOOD BREEDING *is the Hall-mark* OF THOROUGHBREDS

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For the past quarter of a century Hansen air line equipment has been the outstanding *quality* line, never built down to meet a price but always maintained at a high quality level.

Hansen *quality* means more than just a talking point, it means advanced engineering, hair line accuracy, skilled craftsmanship and the finest materials obtainable. Hansen superiority is brought out and demonstrated in greater performance, speed, ease of operation, extremely low maintenance cost and longer life. Thousands of large and small industrial plants throughout the world are completely Hansen equipped.

Hansen—a name which means the finest in modern air line equipment that more than meets the demands of today's production and tomorrow's competition. *Send for free catalog.*

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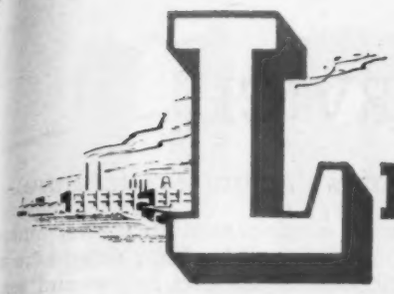

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In more than 100,000 industrial plants, Dayton V-Belts are the arteries through which pulse the lifeblood of productive power . . . power that is smooth-flowing and dependable . . . power which enables millions of machines of every type to convert raw materials into battle weapons, supplies and materiel.

Today, when every machine must operate around the clock, these strong, flexible, long-life Dayton V-Belts increase output—cut power losses and reduce maintenance time and costs to a negligible minimum. And because Daytons run cool and grip firmly they assure closer speed control.

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The World's Largest Manufacturer of V-Belts
DAYTON, OHIO

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BUY WAR BONDS AND SAVINGS STAMPS

Dayton V Belts
LIFELINES OF POWER VITAL TO VICTORY

THE GREATEST NAME IN V-BELTS

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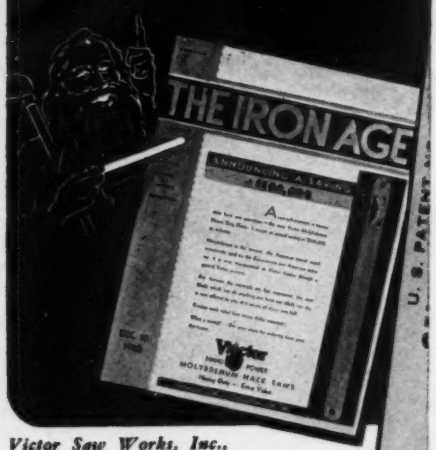
10 YEARS AGO

This blade solved today's metal sawing problem



Victor Saw Works, Inc., advertisement on front cover of "The Iron Age" for Dec. 10, 1932.

Ten years ago VICTOR introduced the first molybdenum alloy hack saw blade—bringing a tremendous saving in heavy duty metal sawing costs.

Today VICTOR "Moly"* High Speed—better by far in steel, heat treatment and uniformity—is being adopted by war production plants everywhere—with no impairment of cutting efficiency.

When you buy power or hand blades for high speed work, be sure to specify VICTOR "Moly"* High Speed—the original molybdenum alloy blade, unexcelled today. Look for the all-over gold metallic finish that identifies the genuine.

For awkward work, *it's VICTOR Unbreakable Special Flexible—that cuts like an all hard, yet cannot be broken in use in a frame. Green metallic finish.*

VICTOR SAW WORKS, INC.
MIDDLETOWN, N. Y.

VICTOR MOLY HIGH SPEED

Victor

**T. M. Reg.—introduced and made only by Victor Saw Works, Inc., and affiliated companies.*

FACTORY'S CATALOG SERVICE

Use the Coupon to Get Manufacturers' Literature

FACTORY, through the cooperation of leading manufacturers, makes possible for you to secure catalogs, bulletins, and booklets listed here without cost or obligation. Check and fill out the coupon below and send to FACTORY.

—1—

A.C. WELDERS—Complete line of a.c. welders, with current ratings from 100 to 500 amps., is described and illustrated in Booklet B-3136. Featured are 500-amp. industrial welder for high-speed, continuous welding on heavy construction, and 300-amp. portable welder for heavy-duty work. Advantages of a.c. and d.c. welding compared. Westinghouse Electric & Mfg. Co.

—2—

ARC WELDING ACCESSORIES — for women, designed to meet the needs of America's new and growing army of girl welding operators. Bulletin GEA-3295 gives details of tailored leather welding jackets, sleeves, aprons, gloves; flameproofed duck aprons and sleevelets; and a special flameproofed hat. Protective goggles, ventilated hand-shields, plain and flip-front welding helmets are shown also. General Electric Co.

—3—

AUTOMATIC CONTROL—Catalog N-00A describes control equipment capable of handling any process that can be controlled by positioning a valve or other regulating device. Diagrams and text explain how the equipment is adusted to fit the needs of a particular process. Leeds & Northrup Co.

—4—

CAPACITORS—How industrial plants c increase power capacity quickly and save cr cal materials is pointed out in text a drawings of Bulletin GES-3039. What c pacitors are and how they work are fu and simply described. General Electric Co.

—5—

CLEANING—materials and methods. For three production degreasing and maintenan cleaning operations in aircraft and accesso plants are reviewed in 40-page manual. I cluded are data on the uses of tank imm sion, washing machine, acidic, solve steam-detergent, and pressure-spray metho Oakite Products, Inc.

—6—

ELECTRICAL EQUIPMENT—Further l ing of inspected electric equipment, supp menting list published in May 1942. Und writers' Laboratories, Inc.

—7—

ELECTRIC ETCHERS—Folder descri and pictures types of etchers for all-purpo work and heavy-duty, standard, or thin-l etching. Pencil-like electric marker for ma

MAILING COUPON—GOOD UNTIL APRIL 30, 1943, ONLY

FACTORY MANAGEMENT & MAINTENANCE (February, 1943)
330 West 42nd Street, New York, N. Y.

Please have manufacturers send me, without obligation, literature below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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35	36	37	38	39	40										

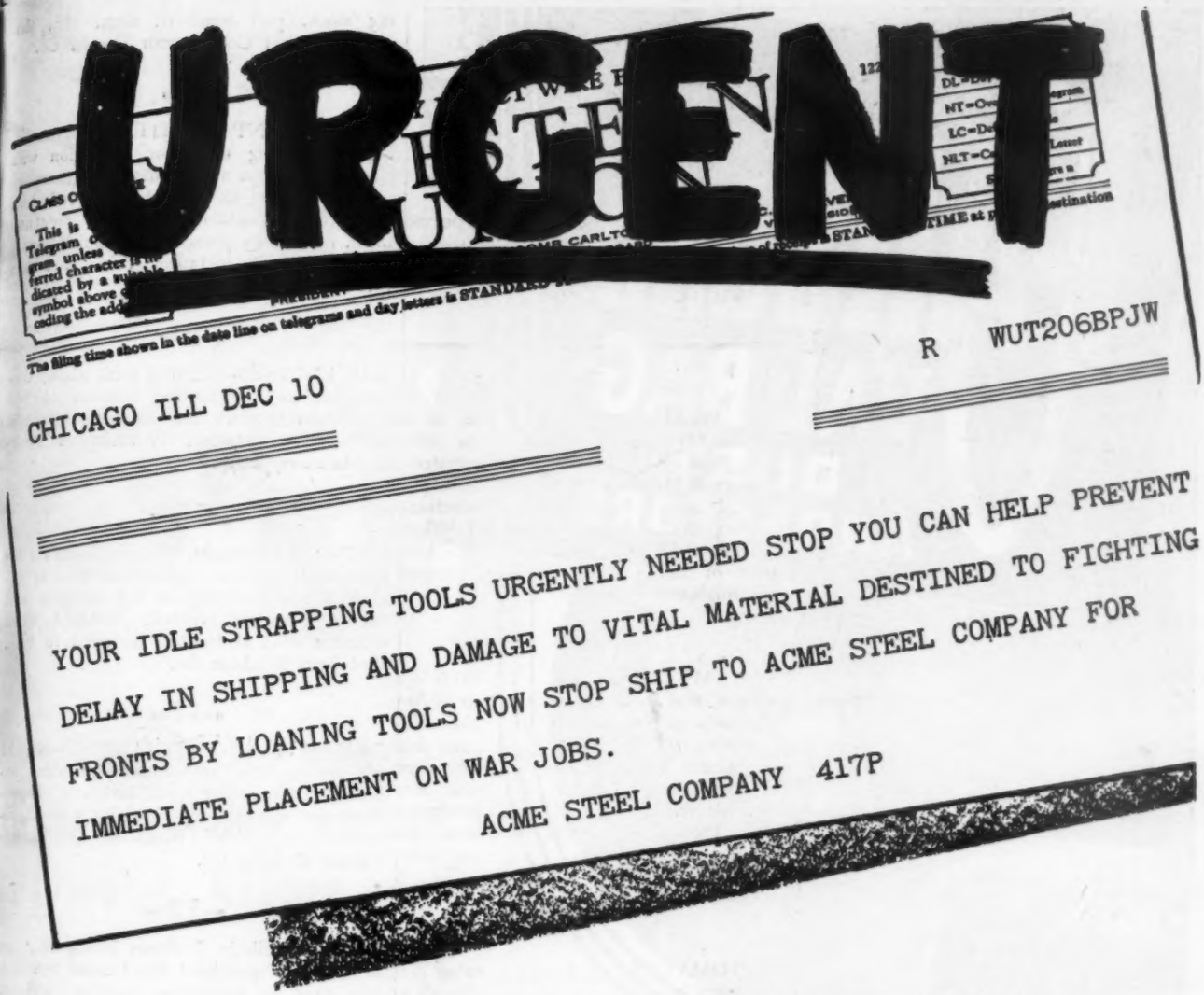
Name ..... Title .....

Company .....

Street Address .....

City ..... State .....

Please fill out this coupon completely in order to avoid delay in handling. Numb correspond to descriptive paragraph numbers.)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YOUR IDLE STRAPPING TOOLS URGENTLY NEEDED STOP YOU CAN HELP PREVENT
DELAY IN SHIPPING AND DAMAGE TO VITAL MATERIAL DESTINED TO FIGHTING
FRONTS BY LOANING TOOLS NOW STOP SHIP TO ACME STEEL COMPANY FOR
IMMEDIATE PLACEMENT ON WAR JOBS.
ACME STEEL COMPANY 417P

Because steel strapping helps to assure safe, damage-free arrival to all types of shipments, from crated fighter planes to cartons of canned foods . . . demand for the speedy Acme strap-applying tools has taxed our capacity to the limit . . . . . all strapping tools are made from critical materials.

How to draft your idle strapping tools for war work

Just send your unemployed Acme strap-applying equipment to Acme Steel Company. These tools will be placed with the armed services and in war plants. On strapping tools made by others than Acme, write the manufacturers.

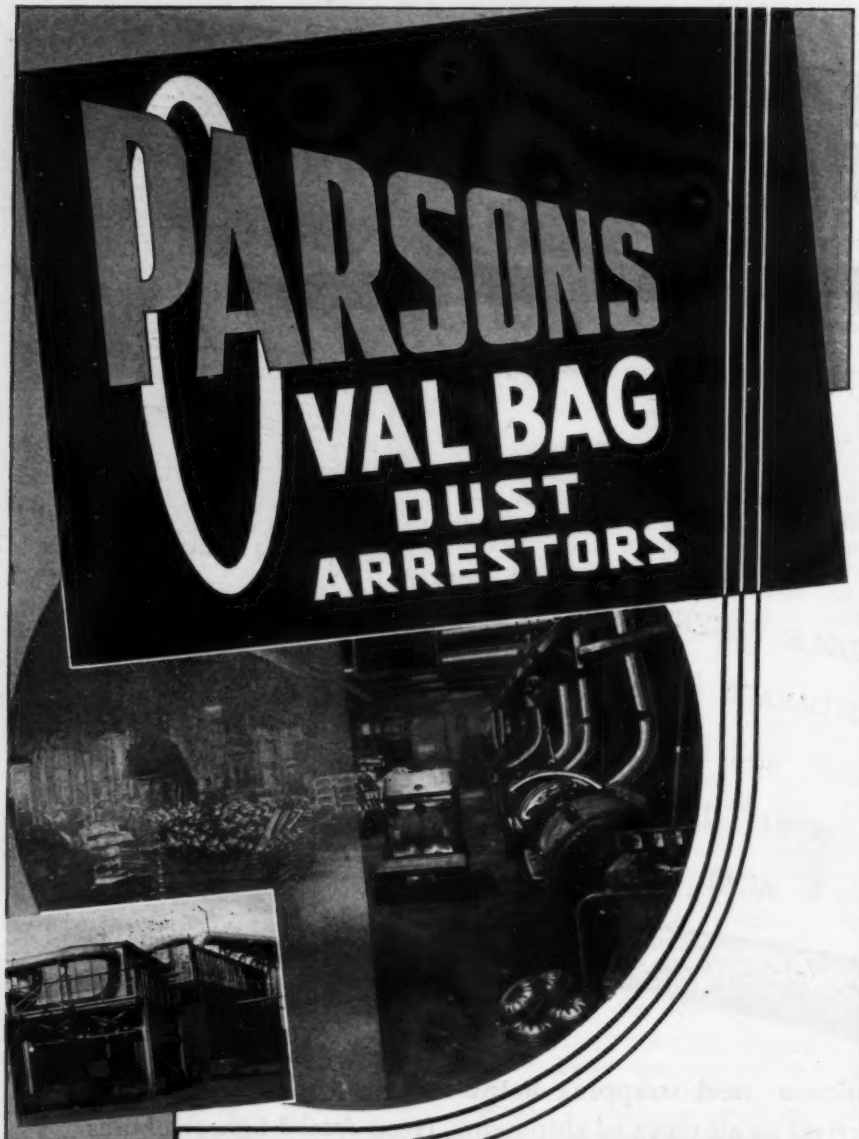
Tools loaned will be replaced

The Acme tools which you loan to the war effort will be replaced whenever you need them. Or if you prefer, a cash credit, based on their present return value, is readily available. Will you please check up today . . . then let us know how many Acme strap-applying tools you can spare and ship them direct to us.

ACME *Steelstrap* PROCESS

ACME STEEL COMPANY General Offices: 2831 Archer Avenue, CHICAGO, ILLINOIS

Atlanta • Baltimore • Boston • Detroit • Indianapolis • Los Angeles • Milwaukee • New Orleans • New York • Philadelphia • Pittsburgh
Portland, Ore. • St. Louis • St. Paul • San Francisco • Seattle • also representatives in other principal cities
ACME STEEL COMPANY OF CANADA, LTD., Montreal, Toronto, Winnipeg, Vancouver



CLEARING *the* COBWEBS *from the Air!*

Nothing slows up production, cripples machinery and impairs the health of your employees like dust and dirt. Parsons Oval Bag Dust Arrestors with their many exclusive patented features cleans the air thoroughly of all dust and dirt and converts a dreary foggy plant into a real bright pleasant place to work.

Aside from the smooth thorough economical cleaning action of Parsons Oval Bag Dust Arrestors, they are a gilt edge investment because they not only pay for themselves in increased production but in hundreds of cases the "fines" actually pay for the installation in a very short time.

Write in for free catalog "Mastery Of The Air."

PARSONS ...a name which means over a quarter of a century of specialized engineering experience in dust control.

PARSONS ENGINEERING CORP.
CLEVELAND, OHIO

ing stock, part numbers, sizes, etc., also featured. Ideal Commutator Dresser Co.

–8–

FLUORESCENT LIGHTING—Seven industrial lighting units for utilization with fluorescent lamps are pictured and described in L-78 catalog sheets. Masonite reflectors, non-metallic shielding eggcrates, floorlamp units, mechanic's portable, and quick-starting fluorescent units included. Prices and sizes listed. Edwin F. Guth Co.

–9–

GAS ENGINES—Detailed facts about construction and outstanding features of type CCG gas engines are given in Bulletin S-550-B21. Illustrated. Worthington Pump & Machinery Corp.

–10–

GRINDERS—Booklet, "Work Done on the Blanchard," presents typical examples of machining and finishing of flat surfaces with various types of grinders. Indexed wheel data for work at hand is included in back. Blanchard Machine Co.

–11–

GRINDING AND POLISHING—Booklet outlines improved technique of grinding, finishing, and polishing metal products. Equipment for speeding up finishing jobs is described in "3-M Method." Minnesota Mining & Mfg. Co.

–12–

LABELS—Bulletin 2 shows labels that are being used throughout the United States to save time by expediting, routing, warning, and instructing. Also available, catalog of 528 label ideas. Every Ready Label Corp.

–13–

LATHES—Books and films give practical helps on how to run a lathe. Circular 21-C describes books, films, wall charts, and courses available on lathe operation. South Bend Lathe Works.

–14–

LIGHTING—Dedicated to America's women because "We need them more than ever," this 16-page booklet on lighting shows women in industry and how important good lighting is to their efficient production. Fostoria Pressed Steel Corp.

–15–

LIGHTING—Lighting equipment for combat operation and war production is shown in Catalog 43-S. Information, pictures, specifications of fluorescent and incandescent fixtures are given. Photographs of actual installations are included. The F. W. Wakefield Brass Co.

–16–

LIGHTING—War Booklet, Serial 2130, emphasizes types of lighting products that will

Investigate the complete story of Morrison aircraft stitching. Write for Bulletin No. 7.

Actual photograph of strips of 24ST aluminum, life size, stitched by the Morrison Stitcher. Saw-cut through row of stitches shows remarkable head and stitch uniformity.

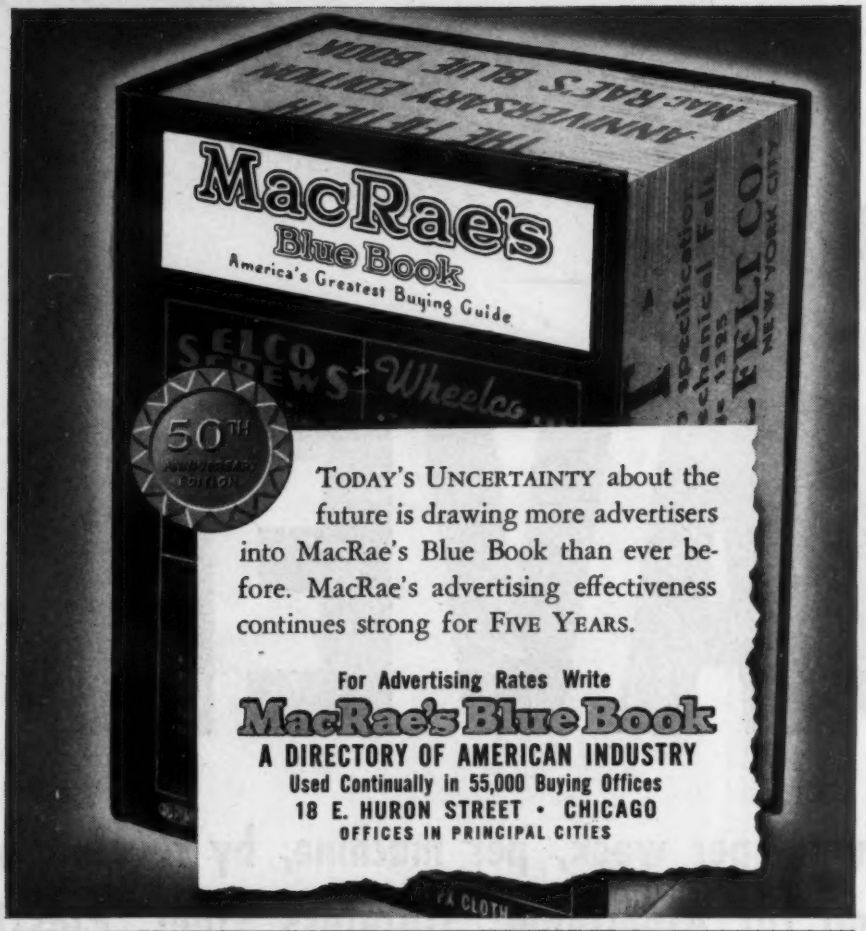
SAVED

Hundreds of man-hours per week, per machine, by revolutionary new assembly method for Aluminum, Stainless Steel, Plastics, Plywood, Rubber, Asbestos, Canvas, etc., in any combination

● **Proof that this improved assembly method is of vital and immediate utility in the aircraft industry lies in the fact that Morrison Stitchers, now in use by contractors, have consistently saved hundreds of man-hours per week, per machine. Moreover, impartial research laboratory tests prove higher strengths and longer life for Morrison-stitched assemblies in many applications. For further information simply write, on your letterhead, for our recent Bulletin No. 8 on Morrison Stitchers.**

MORRISON STITCHERS

PRODUCTS OF THE SEYBOLD DIVISION
HARRIS-SEYBOLD-POTTER COMPANY
DAYTON, OHIO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America's Greatest Buying Guide
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TODAY'S UNCERTAINTY about the future is drawing more advertisers into MacRae's Blue Book than ever before. MacRae's advertising effectiveness continues strong for FIVE YEARS.
For Advertising Rates Write
MacRae's Blue Book
A DIRECTORY OF AMERICAN INDUSTRY
Used Continually in 55,000 Buying Offices
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OFFICES IN PRINCIPAL CITIES

What is a MICRO-CHEK?

● The Trico Micro-Chek is a new type of comparator gage, used on inspection lines, or at machines, which speeds up the gaging of precision parts. It visually multiplies dimensions by 200. Its big, highly visible indicator greatly reduces eyestrain and fatigue. Its simplicity enables inexperienced workers quickly to become accurate inspectors. Our booklet tells more about its many applications.

INSTRUMENT SIZE 6" x 2⅛"

MICRO-CHEK with base plate only....$9.75
Adjustable Anvil.....$3.00
Other type Anvils available.

WHO USES IT?

More than 1500 war plants and government arsenals . . . many of which time and again have re-ordered additional scores of Micro-Cheks.

TRICO

Send for FREE Micro-Chek booklet. Address:
TRICO PRODUCTS CORP., Dept. F, BUFFALO, N. Y.

find frequent use in war industrial plants. "Fluratex" non-metallic reflector units and silver mirrored glass reflector units for conserving critical materials shown. Curtis Lighting, Inc.

–17–

LUBRICATION—"Lubrikarts" for portable power lubrication are presented in Form 22-62. A more comprehensive view of lubricating equipment is given in the charted 50-page catalog, "Alemite." Contains a guide for determining lubricating equipment best suited to lubrication requirements. Alemite Division, Stewart-Warner Corp.

–18–

MANGANESE STEEL—What manganese steel is, its properties, its use in blast furnace departments, in the coke plant, rolling mill, and for miscellaneous steel mill castings are thoroughly explained in 48-page Bulletin 1142-SM. Photographs and drawings are used to illustrate the text. American Manganese Steel Division of the American Brake Shoe & Foundry Co.

–19–

MECHANICAL BRAKEMAN—Folder compares the rigid method of wood bracing carload shipments with full floating the load. Uses of mechanical brakeman illustrated. Signode Steel Strapping Co.

–20–

"ONE HUNDRED YEARS—of Peace and War" is title of handsomely illustrated brochure printed to commemorate the 100th anniversary of this company. Story begins by referring to early pioneer Ryerson family, develops step by step through the growth of the nation's industries, highpointing events that have influenced civilization in relation to steel. Last few pages summarize history-making events by decades. Joseph T. Ryerson & Son, Inc.

–21–

PORTABLE ELECTRIC DRILL—Handbook on its proper use and care to increase life and efficiency. Help to the new worker on assembling the drill, the switch control, drill chucks and bits, use and care of drill, etc. The Black & Decker Mfg. Co.

–22–

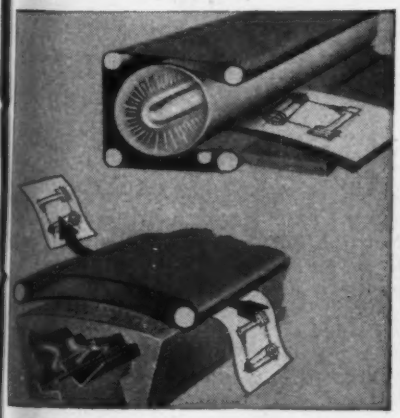
PRESERVERS—Three leaflets, each devoted to a specific type. According to the manufacturer, Ensign 383 rope preserver waterproofs fiber rope; 393 is a metal preserver for preventing rust; and 371, the belt preserver, cleans and protects all kinds of belts. Ensign Products Co.

–23–

RECTIFIERS—"Ignition Mercury-Arc Rectifiers in the Steel Industry," 28-page bulletin, discusses various conversion-equipment problems in the steel industry and possible

THINK WHAT OZALID WHITEPRINTS ARE SAVING US

Thousands of manufacturers using the Ozalid Process point to "everyday" savings in time, labor, and materials—savings which are doubly appreciated when you're rushing supplies to our armed forces.



TIME An Ozalid machine turns out whiteprints of engineering drawings, charts, letters, in two quick steps—Exposure and Dry Development. There's no washing, drying, fixing . . . no cumbersome equipment with a hundred "breakdown" possibilities. Ozalid transparent prints—which may be used in place of valuable original tracings—are produced the same way. No "time outs," as in blueprinting, to change solutions...to rethread the machine.

LABOR Any inexperienced person can be quickly taught to operate an Ozalid whiteprint machine at top efficiency . . . there's never a "labor" problem.

And when draftsmen have to make changes in the design of drawings, precious man-hours can be saved because it's never necessary to redraw any part which remains the same as in the original.

MATERIALS Cut sheets as well as roll stock can be accommodated in an Ozalid whiteprint machine. Thus, by using sheets which correspond in size to your originals, you can completely eliminate trimming waste.

Further conservation is possible because no paper is lost pasting up "leaders." Nor are any Ozalid whiteprints unusable due to distortion.

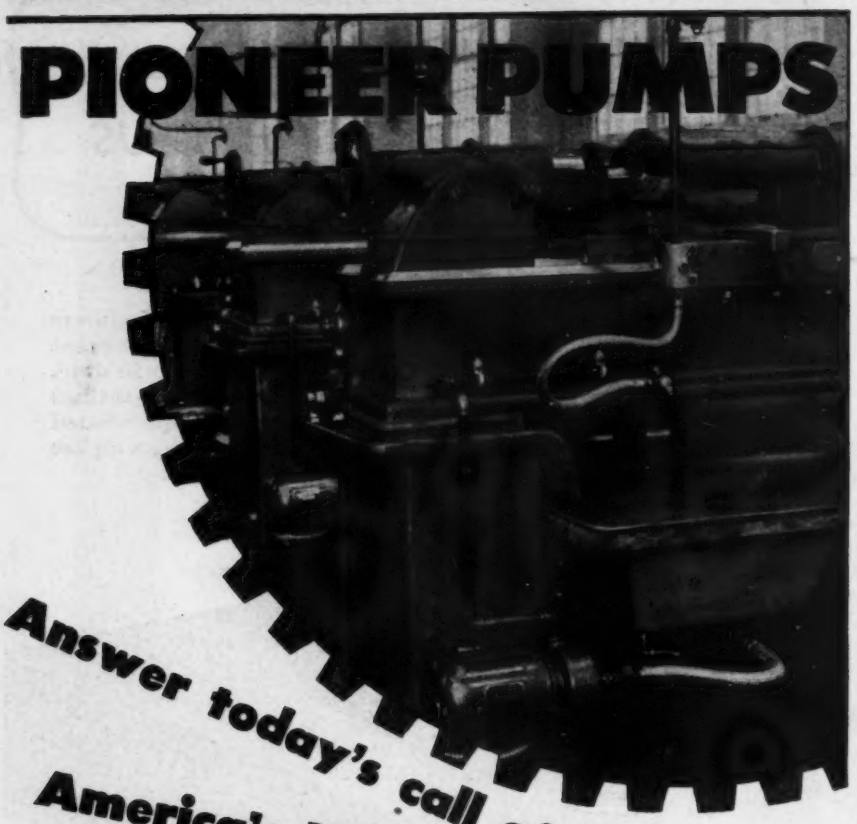
WRITE FOR SIMPLIFIED PRINTMAKING

Our illustrated booklet explains the Ozalid Process and contains samples of Ozalid whiteprints with black, blue, maroon, and sepia lines on white background.

Ozalid Products Division

GENERAL ANILINE & FILM CORPORATION

Johnson City, N. Y.



Answer today's call of America's War Production

Because the Pioneer Pump is able to handle fluid containing solids, chips, and dirt; and because its pressures are greater, this pump is selected in the leading plants doing war work.

The absence of a gland and the perfect sealing of the liquid from the bearings reduce both maintenance and power consumption—both important factors today.

The range of models embraces applications to suit every condition that may be met — from large capacity pumps to small compact units for limited spaces.

PIONEER PUMP
AND MANUFACTURING CO.
19644 JOHN R. • DETROIT, MICH.

application of the ignition rectifier. General Electric Co.

–24–

REDUCTION GEARS—Presented in simplified form, Catalog 33-RG gives data, dimensions, and rating tables on various types of gears. Bulletin 109 deals specifically with full information on type "H" speed transformer. Poole Foundry & Machine Co.

–25–

RHEOSTATS—Bulletin 60A gives general information on rheostats, accessories, and spare parts. Bulletin 69 deals specifically with the 4-in. pressed steel type rheostat and spare parts. Ward Leonard Electric Co.

–26–

SAFETY CLOTHING—and equipment for Industry. Catalog 45 shows protective clothing from hats to shoes, and all kinds of plant safety equipment. Fire curtains and blankets, ladder shoes, illuminated magnifiers, acid pumps, rail clamps, safety treads, paints, and containers, as well as splints, stretchers, protective creams, are among the many safety items listed and described. Safety Clothing & Equipment Co.

–27–

SAFETY SWITCHES—No. 500, 24-page descriptive bulletin, covers the design and listings of all types of safety switches for industrial applications. Manual motor starters also shown. Square D Co.

–28–

SEALS—Oilseals and greaseseals are covered in 16-page bulletin. Detail drawings show applications. Lists of standard sizes for each type are included. Gits Bros. Mfg. Co.

–29–

STEELSTRAPPING — Shippers of items ranging from tomatoes to planes will be interested in Catalog 9. Tells how many types of war and civilian products are protected in transit for safe arrival. Acme Steel Co.

–30–

SWITCHGEAR—Modern types of switchgear now going into wartime power plant construction are reviewed in illustrated catalog B-6185. Contains descriptions of indoor and outdoor switchgear, with removable circuit breakers or fixed breakers. Facts on switchboards, too. Allis-Chalmers.

–31–

THERMOMETERS—Five bulletins. G23-2, 12 pages, discusses operating principles and gives information to aid the user in selecting the proper instrument for his application. G503-2 and G-403-2 describe the recording thermometer, while G603-2 and G303-3 cover the indicating thermometer. Wheelco Instruments Co.

–32–

TOOL SALVAGING—Contribution to the war effort, a poster on salvaging broken tools

GROWING PLANTS

Selective cutting under scientific woods management has harvested over-age trees and left a healthy, vigorous forest. New seedlings for tomorrow's forest will spring up where sunlight can reach down to the forest floor.

Plants for Industry - Today and Tomorrow

Roof Trusses by Timber Structures, Inc., Portland, Ore.

Engineers, Architects, Designers, Builders in every field of industry now are using engineered timber for heavy duty structures. The TECO Timber Connector System made this possible. You, too, can design in timber with TECO. *Write for our literature today.*

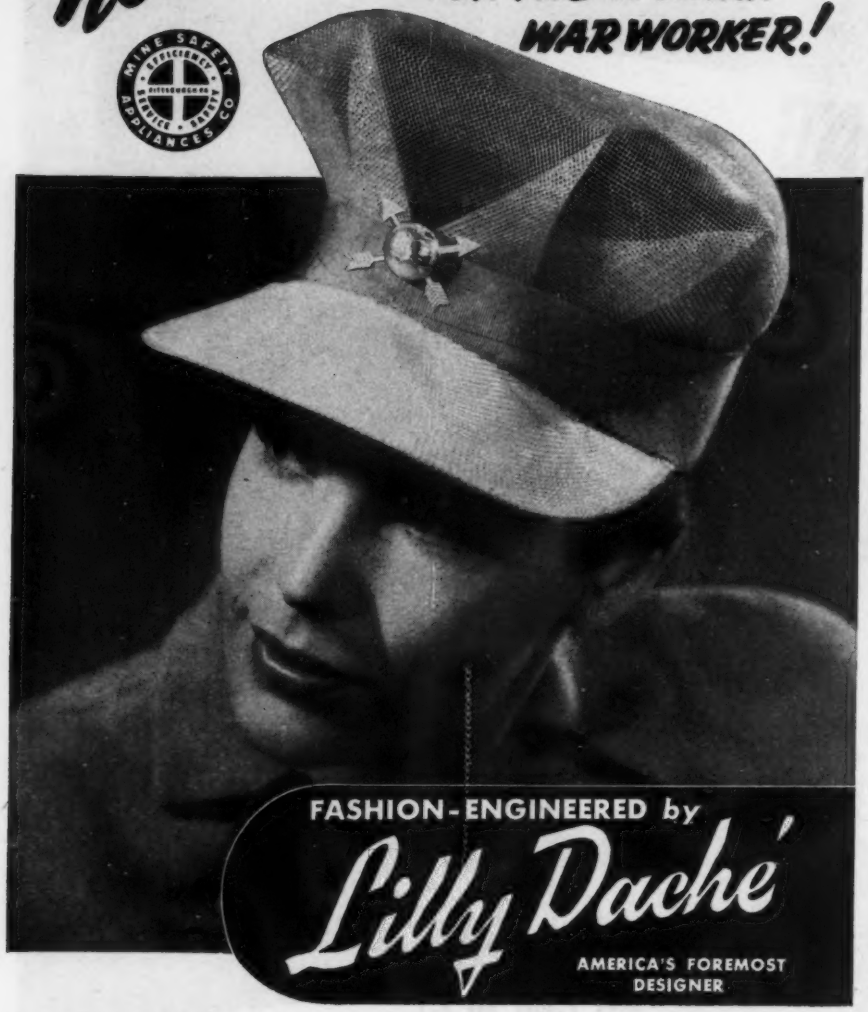
The TECO Ring Connector spreads the load on a timber joint over practically the entire cross-section of the wood . . . brings the full structural strength of lumber into play.

Timber ENGINEERING COMPANY

PORTLAND, OREGON

WASHINGTON, D. C.

Now—THE Right HATS FOR THE WOMAN WAR WORKER!



FASHION-ENGINEERED by *Lilly Dache'*

AMERICA'S FOREMOST DESIGNER

1. HIGH-FASHION DESIGNS
2. HIGH-QUALITY PLASTICS
3. FOUR ATTRACTIVE STYLES
4. COOL
5. LIGHTWEIGHT
6. MOISTUREPROOF
7. COMPLETE HAIR COVERAGE
8. WASHABLE
9. FIT ALL HEADS

When the country's leading designer of top-fashion hats for women produces an industrial line—that's *news!*

And when these Lilly Dache' creations have the smartness of her salon models—carry the Dache' label—and meet all of the requirements of your women workers for *beauty, protection* and *durability*—you have a morale-sustaining opportunity that warrants immediate action. Write today for our descriptive Bulletin—and ask to have an M.S.A. representative show you these attractive hat designs!

Just off the press—ready for you now—the detailed story of Lilly Dache' Industrial Hats.

MINE SAFETY APPLIANCES COMPANY

BRADDOCK, THOMAS and MEADE STREETS, PITTSBURGH, PA.

District Representatives in Principal Cities

for re-use has been prepared for distribution to war plants. Steps on how to do it outlined. Treats broken broaches, milling cutters, drill shanks, form tools, etc. Eutectic Welding Alloys Co.

–33–

TOOLS—Catalog "Can You Afford to Gamble with Production Delays?" may help solve a problem in tool designing, machine repairs, machine installation. Shows special types of tools and tool heads designed for defense jobs. Invincible Tool Co.

–34–

TRANSFORMERS—Where and how to use dry-type transformers, with photographs, construction details, prices, and wiring diagrams are among the data supplied in Bulletin GEA-897-J. General Electric Co.

–35–

TURRET LATHES—Detailed specifications of Foster No. 5 ram-type turret lathe covered in 16-page catalog. Attachments and bar, chucking, and cross slide tools also listed. International Machine Tool Corp.

–36–

WAR HOUSING—Leaflet claims to hold "The proven answer to America's need for greater speed in war housing." The many uses of Upson Strong-Bilt Panels are graphically described. The Upson Co.

–37–

WELDING—"Weld Thin Metals" tells how to handle metals as thin as 32-gage—aluminum, stainless steel, nickel, copper, brass, lead, and many others—with the Weld-O-Tron. Basic questions and answers about thin-metal welding included in this bulletin. Allis-Chalmers.

–38–

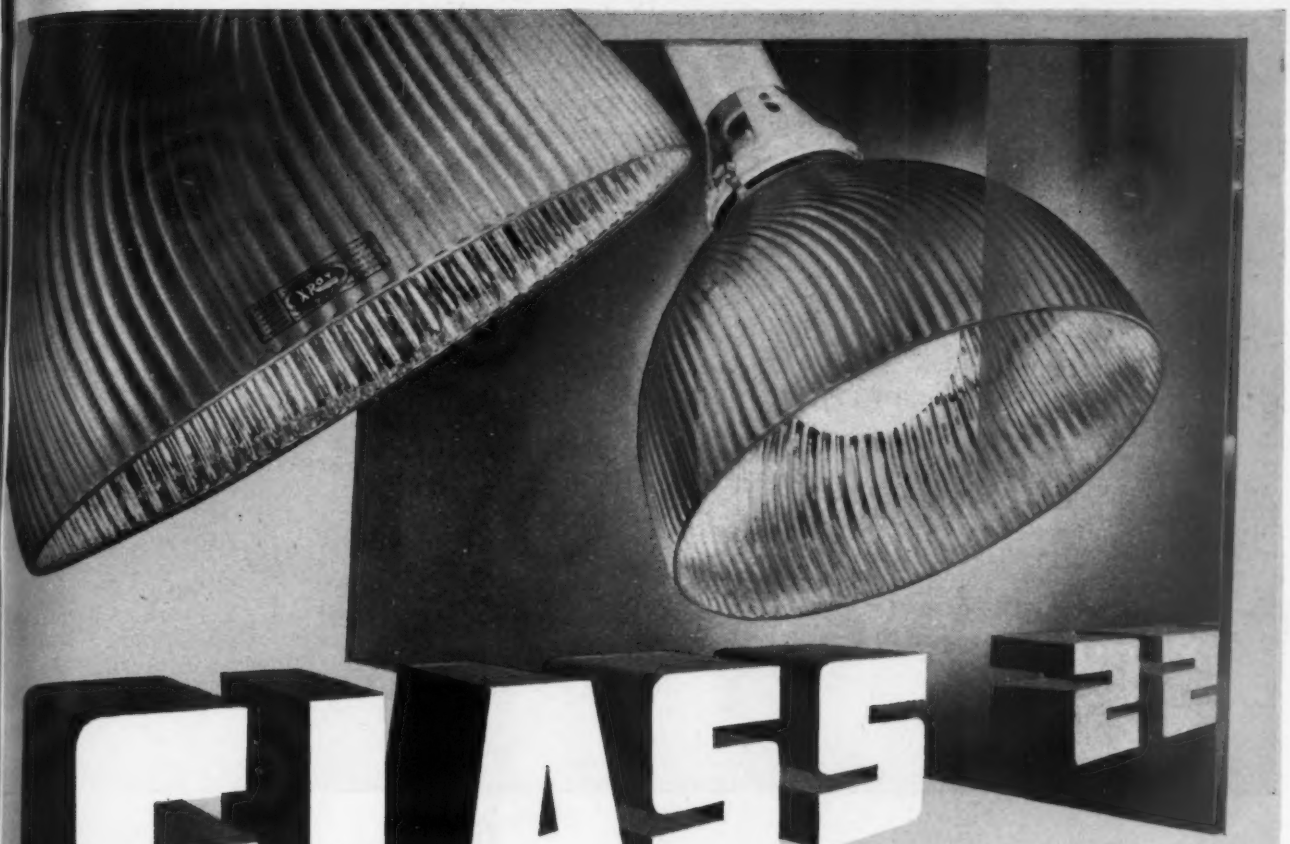
WIRE—Four folders. Form 594 describes various types of industrial wire cloth. Form 591 is devoted to foundry riddles. Wire baskets for several different applications are illustrated in Form 595. Window guards are the subject of Form 592. Buffalo Wire Works Co.

–39–

WOOD—"The Forest Fights" is title of book of news pictures showing the jobs the forest industries have done and are doing to forward the nation's war efforts. Contains 200 photographs, brief text, picturing wood in some war use. Uncommon or revived uses of wood, improved engineering methods in timber, research that is developing broader uses for wood are described also. National Lumber Manufacturers Assn.

–40–

WOOD PARTITIONS—Booklet on wood partitioning for offices, cubicles, toilets, and factory. Interchangeability and movability stressed. Illustrated with photographs and mechanical drawings. Mills Co.



GLASS

Reflectors Make *Light* Work for *Victory*

Scientifically controlled lighting with "X-Ray" Silver Mirror Reflectors speeds up production

Less critical materials

Available now

Superior in efficiency

Low maintenance cost

Moderate first cost

Long life

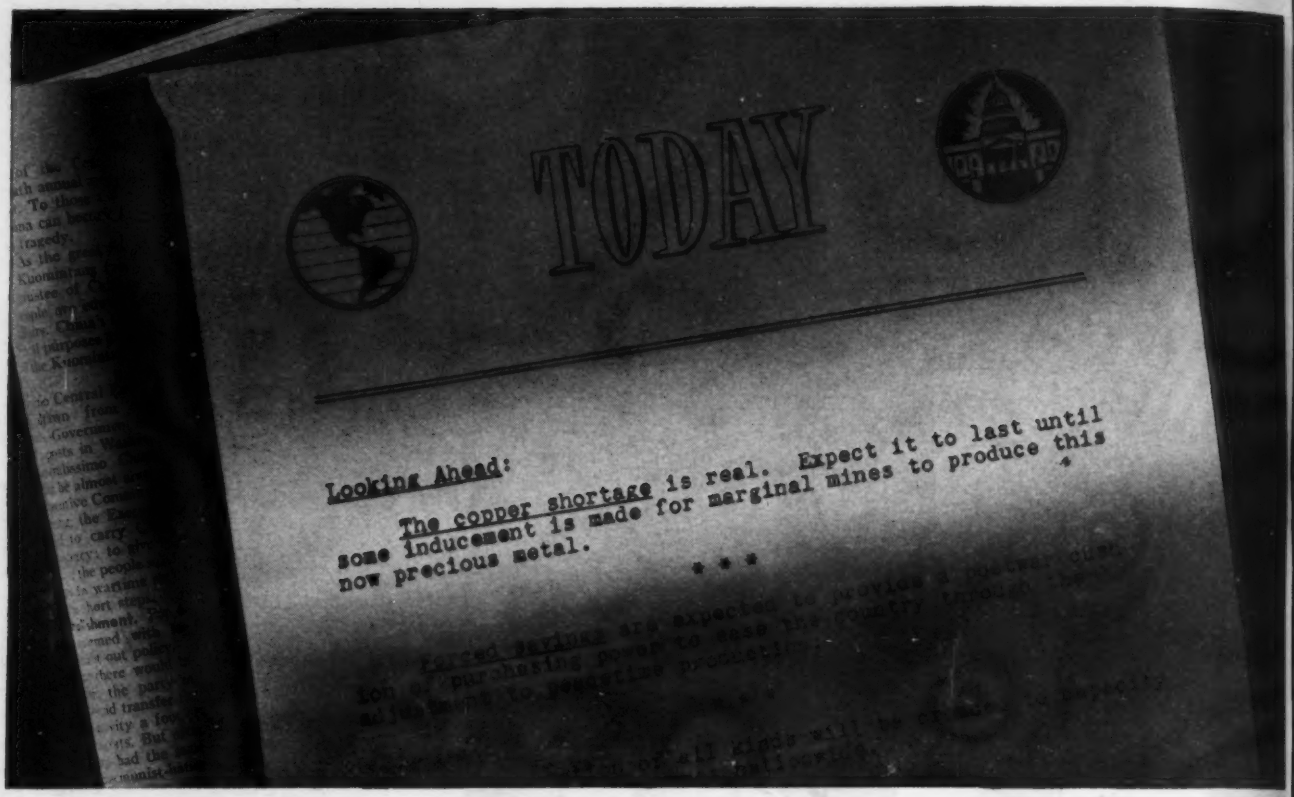
"X-RAY" Reflectors for industrial lighting are made of materials readily available now. They are practical, economical and trouble-free. Silver Mirror Glass is the most efficient reflecting surface used commercially. "X-Ray" Silver Mirror Reflectors are manufactured by the pioneer firm of lighting engineers whose background in the production of Silver Glass Reflectors extends over 45 active years.

A complete line of glass reflectors is available for standard incandescent lamps from 100- to 1500-watts, and also for the 400-watt Mercury Vapor lamp. The larger reflectors are designed for general high and low bay lighting, with smaller sizes for restricted areas such as shops, drafting rooms, and laboratories.

The Curtis representative located in a principal city near you is ready to help you with your lighting problems. For further information call or write him, or send your inquiry direct to the address below.

CURTIS LIGHTING, INC.

6135 WEST 65TH STREET • CHICAGO, ILLINOIS


TODAY
Looking Ahead:
The copper shortage is real. Expect it to last until some inducement is made for marginal mines to produce this now precious metal.
* * *

GOULD KATHANODE'S new type connectors deliver full current load for all makes of industrial trucks

YES, copper is scarce—but that's a problem that Gould engineers have licked. The connectors on the Gould Kathanode you buy today consist of lead of heavy cross section which delivers the same high voltage and performance as copper. Admittedly not as desirable as pure copper—the important thing is, they do the job. If you need a new battery, don't let the copper shortage stop you.

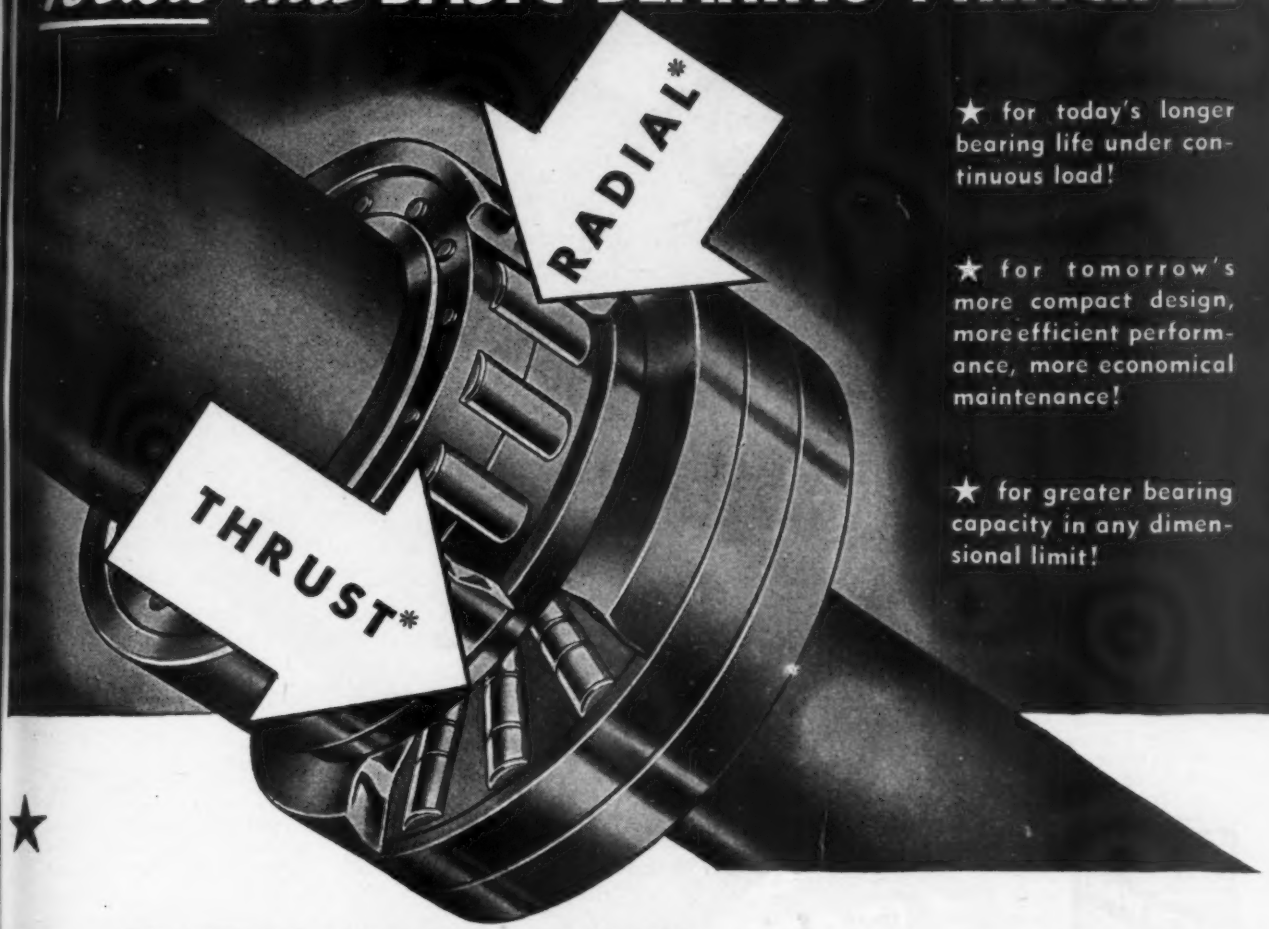
But first make sure you are getting the most out of your present Gould Kathanode. Its spun glass construction introduced by Gould to American industry doubles battery life—which means that Gould Kathanode will last twice as long as ordinary batteries lacking this feature.

RATED CONSERVATIVELY...Goulds will equal or exceed in capacity any battery of comparable size and cell structure. Buy on proven performance and you'll buy Gould!

FREE HELP ON BATTERY PROBLEMS—*Your Gould Service Man will help you get full service from your present equipment, regardless of make. No charge, no obligation. Write Gould Storage Battery Corp., Depew, N. Y. Ask for FREE descriptive literature on any type of industrial installation.*

GOULD THE BATTERY PICKED BY ENGINEERS

Follow this BASIC BEARING PRINCIPLE



★ for today's longer bearing life under continuous load!

★ for tomorrow's more compact design, more efficient performance, more economical maintenance!

★ for greater bearing capacity in any dimensional limit!

ROLLWAY'S RIGHT-ANGLED LOADING . . .
"better because it's simpler"

War has engineered complexity out of design, made simplicity a *"must"*. But in bearings—*the point around which most designs evolve*—Rollway's right-angle loading long ago reduced load problems to their two simplest components—*pure* radial and *pure* thrust.

The underlying principle is basic and universal. You *know* that every radial load and every thrust load is carried full-on, AT RIGHT ANGLES TO THE ROLLER AXIS. No oblique forces, no uncomputed resultants affect your design.

And every part of every load is supported by solid, cylindrical rollers of uniform cross-section. There's no weak point to invite stress localization, no wedging pressure, no danger of rollers pinching against the radius of the race.

Standard Sizes for Most Applications

S.A.E. or American Standard metric dimensions and tolerances are available for most applications . . . a wide range of sizes and types that are "engineered to the job." Avail yourself of Rollway's specialized bearing experience. Send your design or change-over sketch for free, confidential bearing analysis and recommendation. No obligation.

*TYPE MCS DOUBLE WIDTH RADIAL

*TYPE SDT DOUBLE ACTING THRUST

ROLLWAY BEARING COMPANY, INC., SYRACUSE, N. Y.

BUILDING HEAVY-DUTY BEARINGS SINCE 1908 — BEARINGS

HERE IS DUST-STOP'S NEW "WAR" FILTER!

SQUARE GRILL of heavy Kraft cardboard replaces metal grill with round openings formerly used on Dust-Stop* Air Filters. Standard filter adhesive now used.

1 Quickly available

2 Price and maintenance economy the same

3 Filtering efficiency maintained

4 Saves critical metals and materials

BOMBER and tank plants, instrument manufacturers, scores of other war industries are using Dust-Stops in such great quantities that more of these filters were sold in 1942 than in any other year.

For dust control in precision manufacture means mechanical ventilation or air conditioning. And the makers of such equipment recognize the importance of Dust-Stops and include them in their systems.

Householders, too, have been using Dust-Stops in greater numbers than formerly. For clean filters help assure top efficiency from forced warm air furnaces—a big point with fuel rationing.

It was the responsibility of Dust-Stop engineers to meet this increased demand. They met it by designing a filter—the new "war" filter—which saves critical materials and keeps most of the advantages of the former Dust-Stop.

Most Advantages of the Leader in the Filter Field Remain Unchanged

Performance: Capacity, 2 CFM per sq. in. of area at 300 FPM. Average resistance, new, in inches of water gauge, .065 for 1-inch, .13 for 2-inch.

Economy: Cost only 1c per CFM as original equipment for industrial installations. Less than 1/10 of 1c per CFM to replace.

Maintenance: Filter face can be vacuum cleaned or rapped out, this practice can be repeated once or twice, further reducing maintenance costs.

Easy to Change: Anyone can replace dirty filters with new Dust-Stops in a jiffy.

Availability: Made from all-American materials which are not now listed as critical. Production is being expanded to meet growing requirements.

What about Fire-safety? The famous non-inflammable Dust-Stop adhesive is no longer available. As a substitute, standard filter adhesives are now used. The filter media is still made of incombustible glass fibers.

Owens-Corning Fiberglas Corporation, Toledo, Ohio. In Canada, Fiberglas Canada Ltd., Oshawa, Ontario.

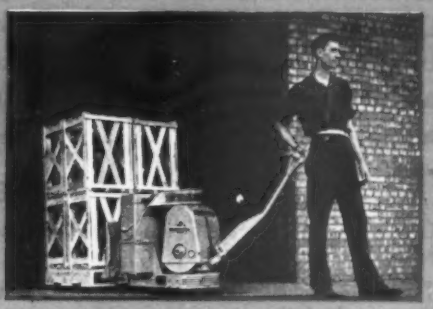
FIBERGLAS* DUSTOP* AIR FILTERS

*T.M. Reg. U.S. Pat. Off.

MAKING EACH HOUR A MORE *Productive* ONE····

Model "THTF-L-6" Center Control 6000 Pound Capacity Telescopic Tilting Tiering Fork Lift Truck for Unit Loads on Pallets or Skid Platforms Standard Forks up to 36" long. Telescopic Lift up to 119"

Model "THTF-L-4" Center Control 4000 Pound Capacity Telescopic Tilting Tiering Fork Lift Truck for Unit Loads on Pallets or Skid Platforms Standard Forks Up to 36" Long. Telescopic Lift Up to 119"



TRANSPORTER PALLET TYPE TRUCKS

Model "P-427" Pallet Type 4000 Pound Capacity "TRANSPORTER" Fork Type Lift Truck. Standard Established Fork Lengths Are Minimum 30" to 60" Maximum in 2" Steps. Standard Fork Height in Low Position is 3½". Lifting Height from Low to High Position is 3½" (Get P-427 Bulletin for Full Details).

PLATFORM TYPES

Model "TN-4 and TW-4" 4000 Pound Capacity and Model "TN-6 and TW-6" 6000 Pound Capacity "TRANSPORTER" Platform Type Lift Trucks for Skid Platforms—Standard Platform Lengths 36" to 72" in 12" Steps. Widths 20" and 26½"; Heights in Low Position 6"; 7"; 9"; 11"; (For Full Details Get "TRANSPORTER" Platform Bulletin).

TRADE AUTOMATIC MARK *Standard* VICTORY MODELS

NOTE: Some "AUTOMATIC" approved models can be furnished with specifications meeting "Industrial Truck Association Spark-Enclosed Equipment" for operation in heavily laden dust or vapor atmosphere such as in arsenals, ammunition depots, and ordnance or chemical warfare plants. These are models "LN-2"; "TLN-2"; "THTF-L-4"; "THTF-L-6"; and "TRANSPORTER" platform and pallet type lift trucks.

Each "AUTOMATIC" Approved Standard VICTORY Model will have the same time-proven features, quality materials, precision workmanship, sturdy construction, and guarantee under which the entire line of "AUTOMATIC" has already won wide industrial acceptance for highly efficient and economical materials handling.

"AUTOMATIC" is ready to serve you now as always without obligation through nationwide Material Handling Representatives who are fully experienced in the application of "AUTOMATIC" equipment. These men are listed in the classified telephone directories in the principal cities and industrial areas under "Trucks, Industrial." In many instances proper planning and co-ordination now with standardized equipment for war production will serve you efficiently for post war activity.

All models are approved types to conserve vital materials and speed up war production materials handling

- Model "TLN-2" 4000 Pound Capacity High Lift Tiering Platform Truck for Skid Transportation and Stacking.
- Model "TLN-3" 6000 Pound Capacity High Lift Tiering Platform Truck for Skid Transportation and Stacking.
- Model "LN-2" 4000 Pound Capacity Low Lift Elevating Platform Truck for Skid Transportation.
- Model "LO-5" 10,000 Pound Capacity Low Lift Elevating Platform Truck for Skid Transportation.
- Model "LN-3" 6000 Pound Capacity Low Lift Elevating Platform Truck for Skid Transportation.
- Model "THTF-M-10" Heavy Duty Center Control 10,000 Pound Capacity Telescopic and Non-Telescopic Tilting Tiering Fork Lift Truck for Unit Loads on Pallets or Skid Platforms.
- Model "TETF-7" Rear Control 7000 Pound Capacity Telescopic Tilting Tiering Fork Lift Truck for Unit Loads on Pallets or Skid Platforms.
- Model "TLO-5" 10,000 Pound Capacity High Lift Tiering Platform Truck for Skid Transportation and Stacking.
- Model "CHTF-2" Center Control-Light Duty 2000 Pound Capacity Telescopic Tilting Tiering Fork Lift Truck for Unit Loads on Pallets or Skid Platform.

MANUFACTURERS FOR OVER 35 YEARS *Electric Propelled* INDUSTRIAL TRUCKS

AUTOMATIC TRANSPORTATION CO.

DIV. OF THE YALE & TOWNE MFG. CO.

GIVE PRODUCTION A LIFT WITH I-R AIR MOTOR HOISTS . . .

12 SIZES, CAPACITIES FROM 300 TO 20,000 LBS.

A sensitive control throttle permits the operator to ease or spot the load into position more quickly and more accurately than can be done with any other hoist.

OTHER ADVANTAGES

Overloading cannot injure the Radial Air Motor.

The automatic brake holds the load, even if the air supply fails.

All moving parts are automatically lubricated in dustproof oil and grease chambers.

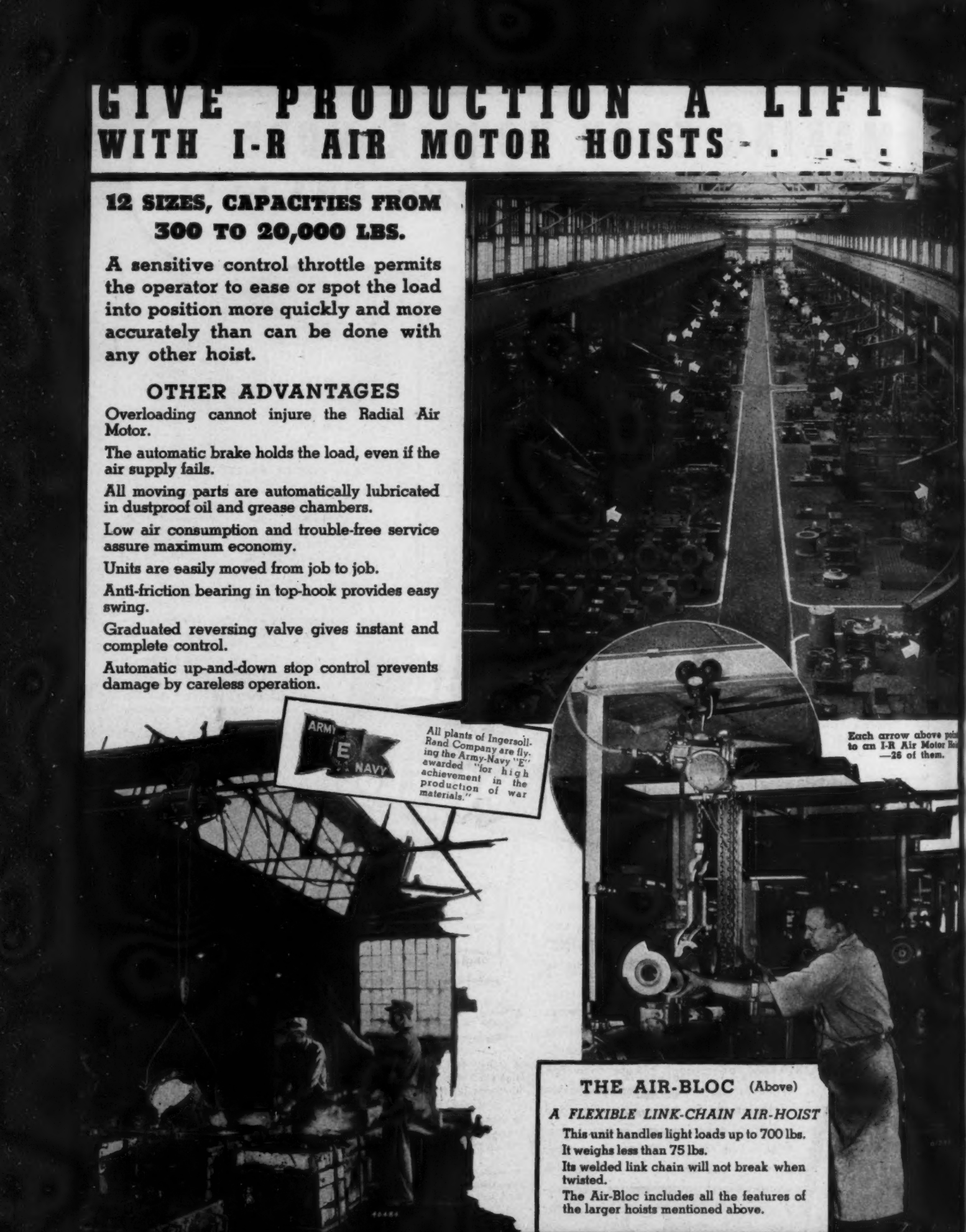
Low air consumption and trouble-free service assure maximum economy.

Units are easily moved from job to job.

Anti-friction bearing in top-hook provides easy swing.

Graduated reversing valve gives instant and complete control.

Automatic up-and-down stop control prevents damage by careless operation.



All plants of Ingersoll-Rand Company are flying the Army-Navy "E" awarded "for high achievement in the production of war materials."

Each arrow above points to an I-R Air Motor Hoist —26 of them.

THE AIR-BLOC (Above)

A FLEXIBLE LINK-CHAIN AIR-HOIST

This unit handles light loads up to 700 lbs.

It weighs less than 75 lbs.

Its welded link chain will not break when twisted.

The Air-Bloc includes all the features of the larger hoists mentioned above.

Atlanta Birmingham Boston Buffalo Butte Chicago Cincinnati Cleveland Dallas Denver Detroit Duluth El Paso Hartford Houston Kansas City Knoxville Los Angeles Newark New Orleans New York Philadelphia Picher Pittsburgh Pottsville Salt Lake City San Francisco Scranton Seattle St. Louis Tulsa Washington

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11 BROADWAY, NEW YORK CITY

Branches or Distributors in other Principal cities the world over.

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2-218

"Easier to Use"

MIDWEST BUTT-WELDING ELBOWS

Welders who have worked on all kinds of piping jobs frequently report that Midwest Welding Elbows are "easier to use" . . . this means an all important saving in time. Layout time is saved because all pipe can be cut in advance according to the drawings . . . time for lining up and tack welding is also reduced.

Midwest Butt-Welding Elbows are "easier to use" because of their greater dimensional accuracy and consistent uniformity. These qualities are inherent in Midwest Elbows because of their unique method of manufacture: they are *sized in compression* (not extruded or stretched) and an exact included angle is the result of special fixtures and tools developed by Midwest for machine-beveling the ends.

Bulletin WF-41 shows the other advantages of Midwest Elbows . . . and the complete line of Midwest Welding Fittings. Write for a copy.

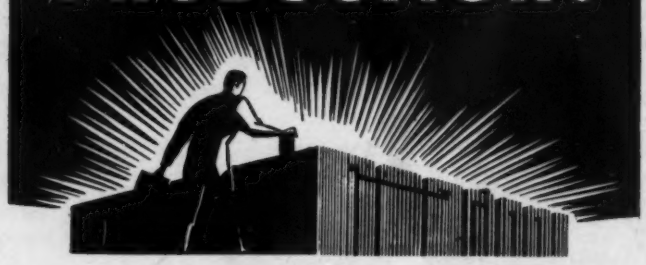
MIDWEST PIPING & SUPPLY COMPANY, Inc.

Main Office: 1450 So. Second St., St. Louis, Mo.
Plants: St. Louis, Passaic (N. J.) and Los Angeles

Sales Offices: Chicago—949 Marquette Bldg. • Houston—229 Shell Bldg. Los Angeles—520 Anderson St. • New York—(Eastern Division) 30 Church St. • San Francisco—535 Call Bldg. • Tulsa—533 Maye Bldg.

MIDWEST WELDING FITTINGS SAVE TIME, IMPROVE THE DESIGN, AND REDUCE THE COST OF PIPING SYSTEMS

how TO SPEED UP WAR PRODUCTION!



Turco Products will help you speed up production by furnishing materials and methods which do a better, safer and quicker job in every department where desoiling, surface preparation or maintenance operations are handled.

In preparation for anodizing or chromatizing; for phosphatizing; for spot welding and weld-masking; for degreasing and decarbonizing of machine parts, and all of the operations listed on the coupon below, there is a thoroughly tested Turco Specialized Industrial Chemical Compound.

TURCO

MAIL THIS COUPON

TURCO CAN HELP YOU SEND FOR INFORMATION NOW!

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Please send FREE literature on materials, methods and procedure pertaining to the operations checked below:

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FIRM_____
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- ☐ Aluminum Spot Welding
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- ☐ Cadmium Plating
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- ☐ Cleaning Prior to Plating
- ☐ Cold Immersion Cleaning
- ☐ Cold Spray Cleaning
- ☐ Floor Maintenance
- ☐ Glass Cleaning
- ☐ General Plant Maintenance
- ☐ Hot Immersion Cleaning
- ☐ Magnesium Processing
- ☐ Paint Camouflage Cleaning
- ☐ Paint Department Maintenance
- ☐ Paint Stripping
- ☐ Phosphatizing
- ☐ Scale Removal and Control
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- ☐ Steam Boiler Maintenance

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Sales and Service Representatives and Warehouse Stocks in All Principal Cities
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OTC IN THE BATTLE OF *Production*

"EVERY PIECE OF FACTORY EQUIPMENT MUST BE EFFICIENTLY MAINTAINED"
DONALD M. NELSON

An important and ever-increasing "task force" of OTC TOOLS is doing a vital machinery maintenance job in War Factories, Shipyards, R. R. Shops, Power Plants, Mills and Mines . . . as well as on tanks, trucks, airplanes, ships.

OTC TOOLS
GIANT SLUGGING WRENCHES
HEAVY DUTY BOX WRENCHES
PULLERS AND PUSH-PULLERS
SPECIAL TOOLS TO ORDER

ARMY E NAVY
OWATONNA TOOL COMPANY
OWATONNA, MINNESOTA

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Specify VICTORIA TOILET TISSUES
Single Fold, Double Fold or Black Core—for dependable quality.
Victoria Paper Mills Co., Fulton, N.Y. Craftsmen in paper-making since 1880.

M-H *Miracles* WITH ELECTRONICS

ELECTRONICS bids fair to revolutionize our every day living after the war. When Minneapolis-Honeywell placed its fifty year experience and manufacturing resources at the call of our government, the results of several years of research in electronics were immediately applied to controls and devices for war . . . Extending this peacetime experience to the techniques of war will bear fruit, when Peace comes, in startling new developments in the electronic control of automatic heating and manufacturing processes. Minneapolis-Honeywell Regulator Co., 2706 Fourth Ave. S., Minneapolis, Minn. In Canada: Toronto, Ontario. In Europe: London, England, and Stockholm, Sweden.

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Instruments by **BROWN** *and Controls by*

MINNEAPOLIS-HONEYWELL

Which of These... SPECIFICATION FINISHES Do YOU Need?

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- Lacquer
- Paints for Ammunition
- Clear Phenol Baking Varnish
- Ammunition Lacquer Enamel
- Spar Water Resisting Varnish
- General Purpose Lacquer Enamels
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- Dope, Cellulose Acetate, Clear
- Aluminum Mixing Varnish
- Lacquers for Shells, Bombs Grenades, etc.
- Paint, Cavity—for Torpedoes

DON'T let the problem of securing the proper Government Specification Finish hold up your war production jobs. You can depend upon our chemists, with their broad experience in formulating Government Specification Finishes for many war products, to give you the finish you must have for the materials or equipment you are producing for the Army, Navy, Air Corps or Marine Corps.

Our many years of pioneering development work in producing exclusive varnishes and lacquers for Permite Ready-Mixed Aluminum Paints, and the facilities of our modern plant, are also at your service.

Clear and colored lacquers, zinc chromate primers, enamels, mixing varnishes, camouflage paints, rust inhibitors — custom-built to your needs to meet Government Specifications — are included in the Permite Line. We also supply Permite Aluminum Paints on WPB allocation.

Quotations on any finishing needs submitted promptly upon request.

ALUMINUM INDUSTRIES, Inc.
CINCINNATI, OHIO

PERMITE *Industrial* FINISHES

WAR PLANT DISTRIBUTION SYSTEM IS ENGINEERED TO CONSERVE MATERIALS

Result:

6400 pounds of Copper saved

A New England war plant planned to install a distribution system requiring 44,200 pounds of copper. Westinghouse engineers recommended a more flexible, better-protected system using 6400 pounds less copper.

Savings like this prove that "custom-fitting" the distribution system to the job helps to conserve critical materials.

There is no one universal distribution system suited to all plants or all industries. That's why Westinghouse plans and builds *all* types. The one that will best fit your plant is the one that takes full account of the nature, density, and location of load—with the least use of critical materials.

Any system recommended is designed to use standard distribution equipment. No time is lost in building special apparatus.

If you want fast action, call our local office. Or send for the helpful booklet shown below. Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

J-94539

HOW WESTINGHOUSE CAN HELP YOU SAVE TIME AND CRITICAL MATERIALS

- **Selecting the Right System**—Wide application experience in all types of industries enables Westinghouse engineers to recommend the system best fitted to your plant.
- **Air-Cooled Transformers**—permit location close to load centers with maximum safety, eliminate expensive vaults.
- **Hipersil**—an exclusive Westinghouse development with ⅓ more flux-carrying capacity than ordinary silicon steel. Reduces transformer size and weight.
- **Loading by Copper Temperature**—permits use of *all* the transformer capacity, with complete protection against burnouts.
- **Improving Power Factor**—through use of capacitors, can often save installation of new feeder lines. Westinghouse engineers are in a position to make such practical recommendations.

QUICK FACTS ABOUT PLANT DISTRIBUTION SYSTEMS

Keep up to date on latest plant distribution systems. Send for Booklet B-3152 which briefly describes different plant distribution systems, and points out the advantages of each.

Westinghouse PLANT DISTRIBUTION SYSTEMS

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

The Policy That Insures

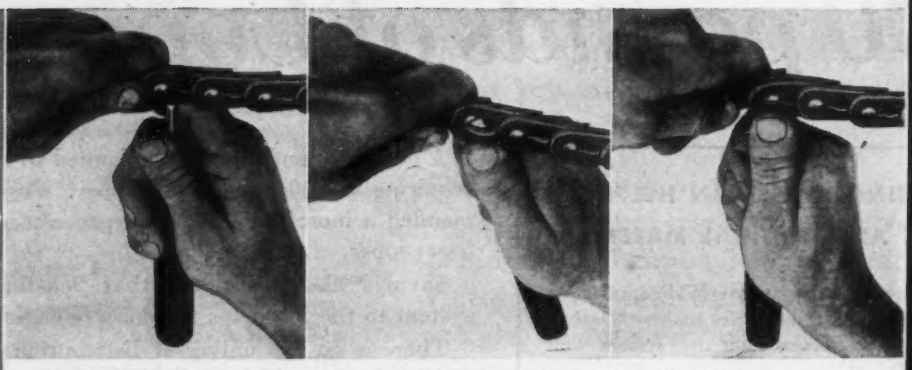
PRODUCTION:

"Standardize on VEELOS"

VEELOS keeps machines running at full speed and productivity because link construction provides quick, easy adjustment . . . reduces machine downtime . . . ends slippage. With Veelos in rolls, strands can be replaced quickly and easily, keeping all belts on the drive and maintaining equal tension. You insure maximum production when you standardize on Veelos for all V-belt drives.

HOW TO UNCOUPLE ALL SIZES OF VEELOS V-BELT

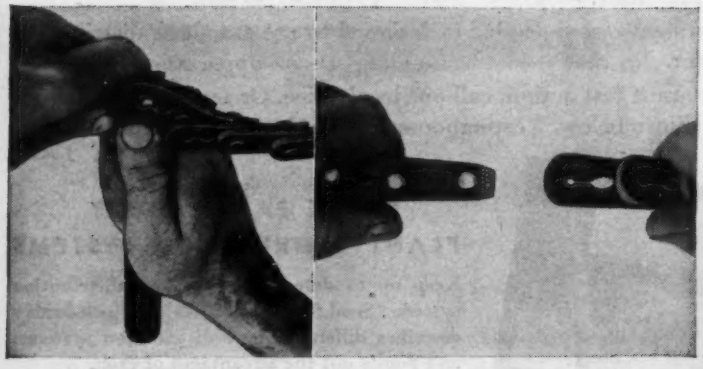
(Note Link Construction)



1. *Hold belt with left hand. Insert screw-driver under top segment as far as slot.*

2. *Hold stock firmly with thumb over screw-driver blade and press handle down.*

3. *Slip tip of blade over rivet head and lift handle enough to pry segment loose.*



4. *Repeat on 2nd rivet for "B"; 3rd rivet for "C"; 4th rivet for "D"; 5th rivet for "E" section belting. Underneath segments removed in same manner until last rivet slips out easily.*

5. *THE BELT IS APART.*

VEELOS

THE LINK

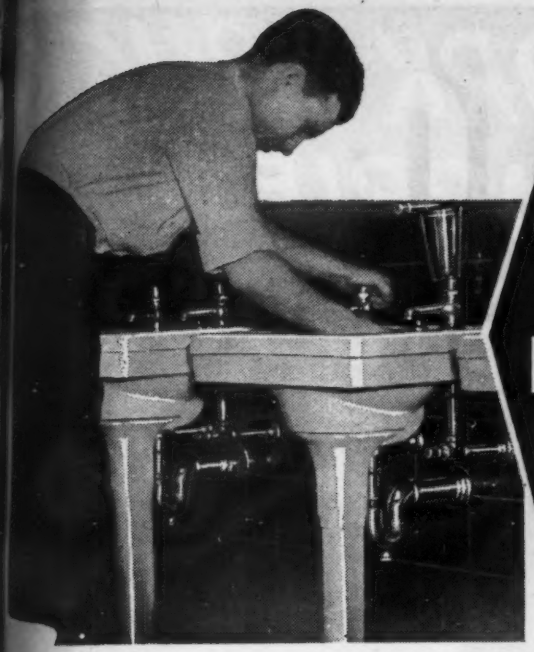
V-BELT

ADJUSTABLE TO ANY LENGTH

ADAPTABLE TO ANY DRIVE

MANHEIM MANUFACTURING & BELTING CO.

MANHEIM, PENNSYLVANIA



Mr. Walter Spies

CHIEF ENGINEER OF NATIONAL CAN CORPORATION

says:

"SHOW ME AN

EFFICIENT PLUMBING SYSTEM

AND I'LL SHOW YOU AN

EFFICIENT FACTORY"

DON'T YANK OUT OLD, WORN, LEAKY FAUCETS!

Now you can re-form their rough, scored seats into smooth, round, precision surfaces, saving costly replacements and helping conserve valuable materials.

This 'Sexauer' patented Precision Tool, used by plant engineers and master plumbers throughout the country, is guaranteed to re-form them ***better*** than when new. Thousands of these tools are in daily use from coast to coast, restoring discarded faucets to long and useful service.

CUT YOUR MAINTENANCE COSTS TWO-THIRDS!

After re-forming faucet seats, install 'Sexauer' patented EASY-TITE Washers. This new laboratory triumph is a resilient, synthetic compound, neither fibre nor rubber, which withstands the softening, disintegrating effect of extreme water temperatures (upwards of 300° F).

Fabric-reinforced like a tire to prevent splitting and mushing out of shape, EASY-TITES outlast half-a-dozen ordinary faucet washers.

FORESTALL PLUMBING BREAKDOWNS WITH PATENTED 'SEXAUER' PRECISION TOOLS AND 'SEXAUER' TRIPLE-WEAR REPLACEMENT PARTS

The 'Sexauer' Line

The Sexauer Mfg. Co. Inc., through more than 20 years, has developed *over 1,000* highly specialized parts for *better* plumbing maintenance and *longer* carefree service. They're listed in the big new 'Sexauer' catalog — 64 well-illustrated pages of time- and money-saving parts and equipment. *Send for your free copy* of this valuable book TODAY.

Leaky, unsanitary toilets, faucets, pipes and fixtures cause tremendous damage — waste water and the fuel required to heat it — impair workers' health, morale and output.

"Sexauer-ize" (safeguard) *your* vital plumbing system. While you slash your maintenance overhead you'll also reduce your water, fuel and power bills — save hard-to-get replacements — achieve the efficient, sanitary service every factory requires today.

'Sexauer' Service

There's a trained 'Sexauer' Service Salesman in your vicinity, ready to consult with you on stocking the correct replacement parts, no matter what style of plumbing fixtures are in your plant. It will pay you to send for him without delay.

FOR 'SEXAUER-SYSTEM' PLUMBING CONTROL, FILL IN AND MAIL THIS COUPON—NOW!

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"Specialists in plumbing maintenance materials for over 20 years"

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☐ Rush free copy of the new 'Sexauer' catalog.
☐ Send details of the portable "SEXAUER-SYSTEM" Kit, a skillful assembly of Precision Tools and 1,326 Triple-Wear Replacement Parts for plant service, as advertised in the SATURDAY EVENING POST.

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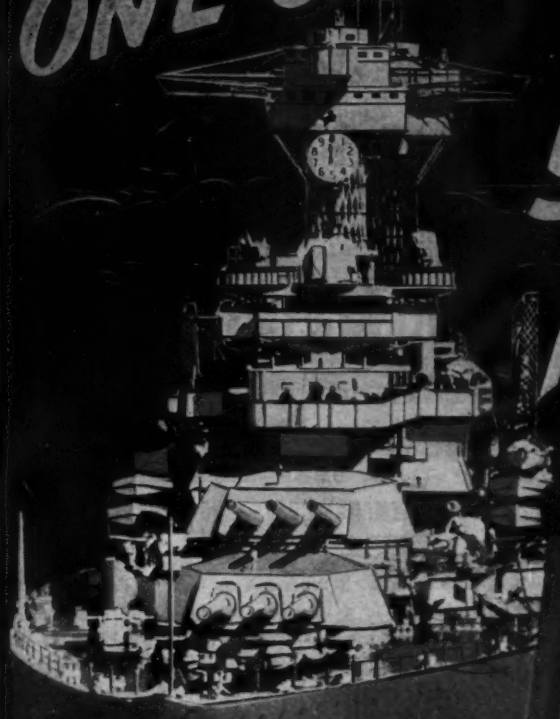
ONE CLARK FORK TRUCK CARRIES 52,000 TONS IN 866 HOURS



52,000 TON
BATTLESHIP
NEW JERSEY

Equivalent to the weight of the largest battleship afloat—the New Jersey.

60 tons per hour—that's moving material.

On the fighting fronts of the world and in the war-producing plants at home—

Clark Fork Trucks keep material moving.

Gas or Battery Powered

Built in 1,000 to 7,000 lbs. capacities.

Clark engineers will solve your material problems.

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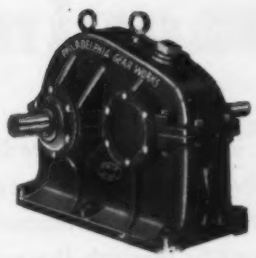
CLARK TRUCTRACTOR
DIVISION OF CLARK EQUIPMENT COMPANY
BATTLE CREEK, MICHIGAN, U.S.A.

WE'RE *Proud* OF THE MANY PHILADELPHIA SPEED REDUCERS HELPING TO SET UP NEW PRODUCTION RECORDS

Throughout America industrial plants are bettering all peacetime production records because men, management and machines have combined in a common purpose to outproduce the Axis, so that our armed forces can outfight them. In many of these plants Philadelphia Speed Reducers are on the job night and day, transmitting a high degree of input power to the production equipment. The continuous service of so many of these units without requiring attention helps keep machines on the job, and saves much valuable time for maintenance crews.

Philadelphia Speed Reducers are built in all types and in a wide range of ratios and horsepowers. Tell us your requirements—our wide experience will prove helpful.



Philadelphia Herringbone Speed Reducer

Philadelphia Worm Gear Reducer

Vertical Type MotoReduceR

Horizontal Type MotoReduceR

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INDUSTRIAL GEARS AND SPEED REDUCERS
LIMITORQUE VALVE CONTROLS

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PHILADELPHIA, PA.
New York, Pittsburgh, Chicago

Philadelphia
LIMITORQUE CONTROL
operates all types of valves, etc., safely, economically, from convenient stations.

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GEARS
All types and sizes of industrial gears. Can be supplied in all materials.

Philadelphia
WORM GEAR SPEED REDUCER
right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.

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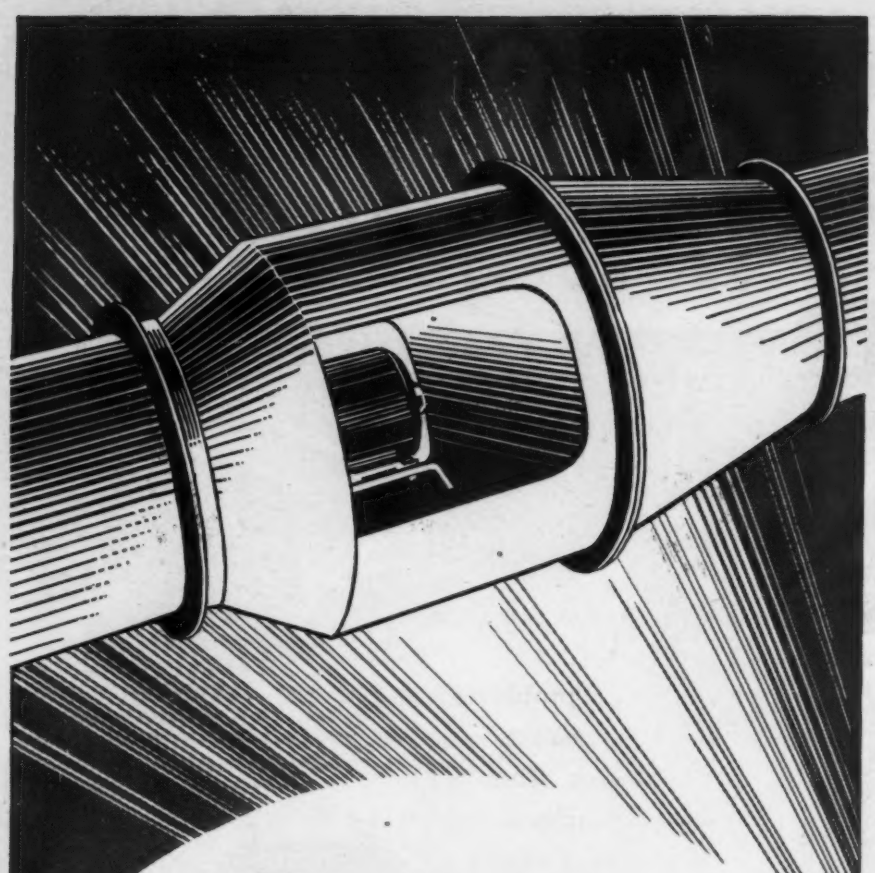
The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.

Philadelphia
HERRINGBONE SPEED REDUCER
for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.



To keep danger moving

IN chemical, industrial and ordnance plants, DeBothezat Bifurcators keep dangerous corrosive and high temperature fumes moving swiftly through the exhaust ducts. The famous "Axial-Flow" pressure fan which moves the fumes has a non-overloading power characteristic for protection against costly motor failure. The motor is located in a through-ventilated chamber isolated from fumes and readily accessible. Bifurcators install right in the duct in any position from horizontal through vertical. Available in a wide range of sizes and capacities. Details on request.

De Bothezat

VENTILATING EQUIPMENT

Division of American Machine and Metals, Inc.

EAST MOLINE, ILLINOIS

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V

V

DOMESTIC APPLIANCE

or

EQUIPMENT MANUFACTURER

interested in consolidation with an old and well established manufacturer to assure stability and diversification in postwar period.

V

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CHARLES H. WELLING & CO., INC.

52 Vanderbilt Avenue
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SUPERIOR TOOLS

can be expected only from

SUPERIOR TOOLMAKERS

The DIEMAKER
The MACHINIST
The INSPECTOR
are no better than their eyes

Can they be spared five minutes from their jobs to check their visual efficiency?

KEYSTONE INDUSTRIAL VISUAL SAFETY (IVS) TESTS

screen out the visually inefficient and automatically classify employees as to their visual fitness.

They detect the probability of visual inefficiency due to conditions correctible by glasses, such as low visual acuity, astigmatic errors, and approaching presbyopia; and others which may not be so readily controlled, such as color blindness, lack of stereopsis, and improper eye co-ordination.

Write for

IS YOUR BUSINESS BLIND, which contains a partial list of nationally known users of the IVS Tests.

KEYSTONE VIEW COMPANY

Industrial Division

Meadville, Pennsylvania

How to Solve Production Problems

with Delta Low-Cost DRILL PRESSES

No. 1370 —Floor type 17-inch "Slo-Speed" Delta drill press with No. 2 Morse Taper Spindle and standard tilting table. Shown with motor.

Many problems that stump production men have been successfully solved with Delta Drill Presses. This has been definitely proven in thousands of cases—on a large variety of operations. Today, these efficient, flexible machines are being used in thousands of plants not only as production line equipment—but as auxiliary machines, special purpose machines, for special set-ups and tool room equipment.

Throw overboard your notions of what can be accomplished with standard drill presses —and get the full details of this remarkable story. You will be in for a distinct surprise!

Ask your Delta Industrial Distributor for Full Details

Your nearest Delta Industrial Distributor is personally acquainted with many actual installations of Delta drill presses in your vicinity. He has photographs and full details showing how Delta drill presses have been used to solve a wide range of production problems. Also ask him for recent issues of "Tooling Tips" which tell in complete detail ingenious and unusual adaptations of Delta machines.

DELTA MILWAUKEE

THE DELTA MANUFACTURING COMPANY
618R. E. Vienna Avenue, Milwaukee, Wis.

Gentlemen: ☐ Send me name and address of Delta Industrial Distributor in my locality.
☐ I want to receive "Tooling Tips" as issued.

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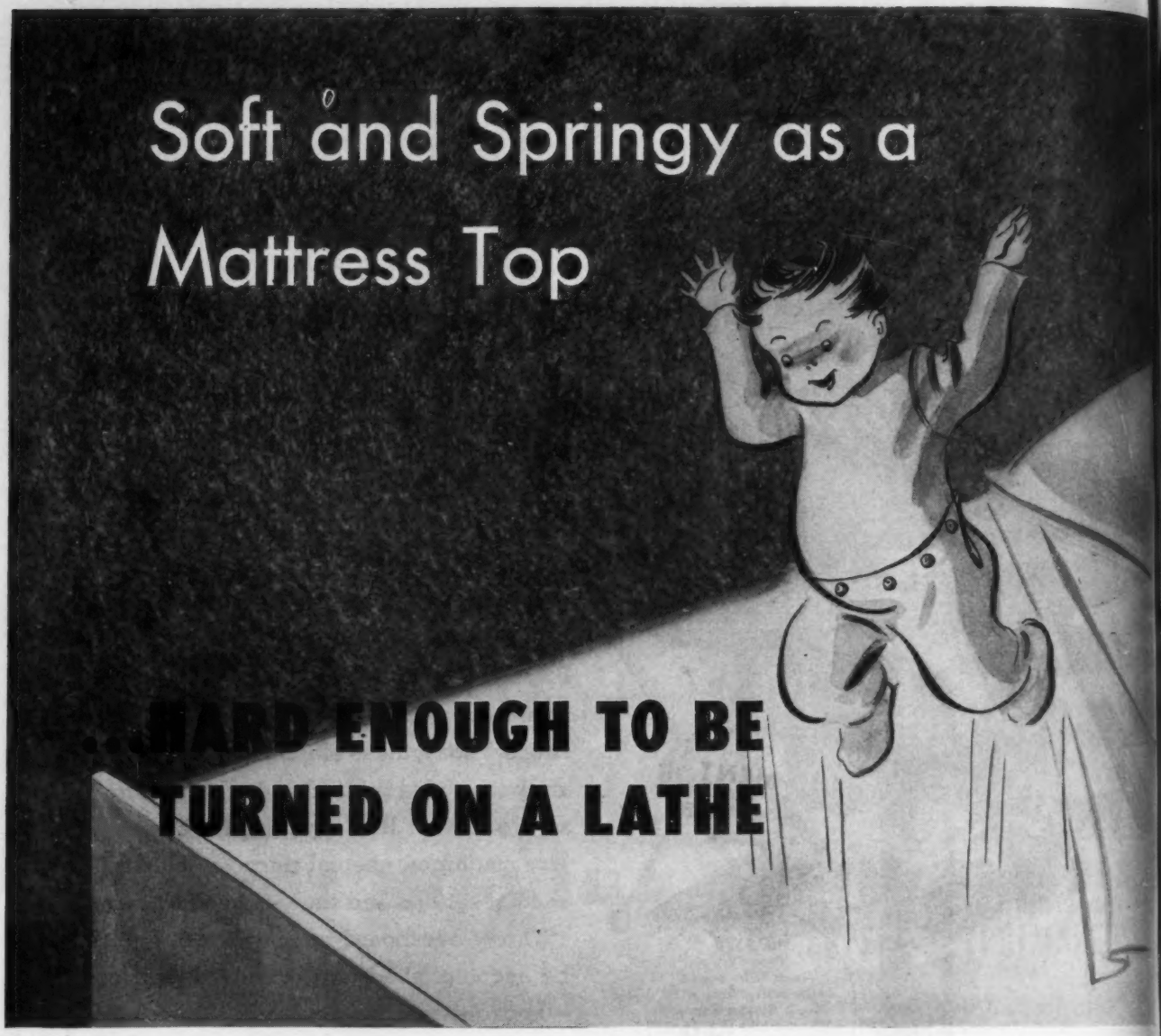
Address .....

Firm .....

City ..... *State* .....



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Felters Felt comes in many grades . . . which have a wide variety of uses. This material can be silky soft . . . wiry tough . . . soft and springy . . . or *hard*. It can be cut with a die, shears or knife . . . punched, perforated, machined . . . used in combination with other materials . . . treated chemically.

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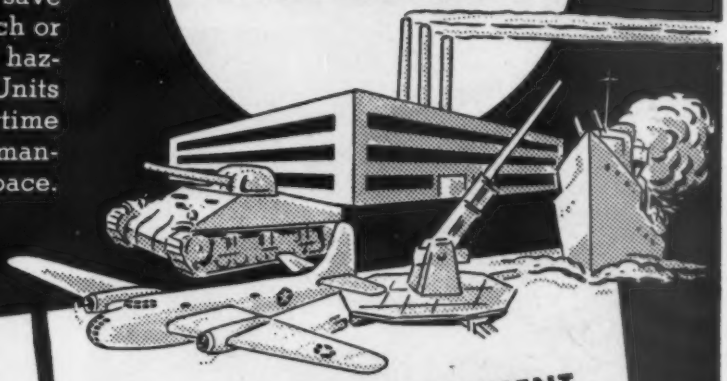
● By using Lyon Shop Equipment and Lyon Storage Equipment, war plants are speeding up the handling of tools and parts . . . are providing the protection the employees, their tools and parts deserve. Lyon Materials Handling Containers, for example, reduce time and cost of transporting small parts, save floor space, speed handling at bench or machine, reduce fire and accident hazards. Other Lyon Shop and Storage Units are all engineered to help meet wartime production schedules by saving man-hours, machine hours and floor space. Write for Catalogs.

For **WAR PRODUCTION**



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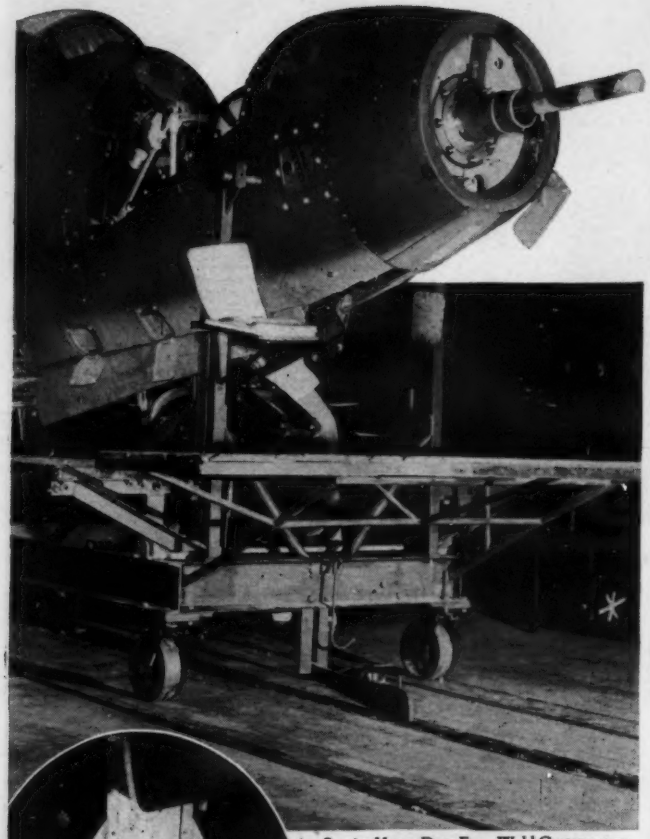
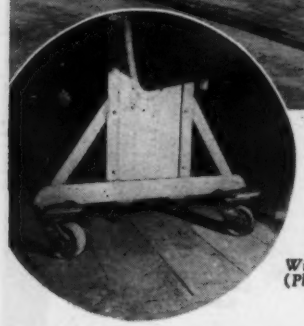
The Army P-39 Airacobra Creeps Before It Flies





Service Heavy Duty ForgeWeld Casters carry the Airacobra the first half mile of its career, as shown above on the assembly line of Bell Aircraft, Corp.

Wing dollies also employ Service ForgeWelds (Photos courtesy of Bell Aircraft Corp.).

Look for a Possible Caster Application Wherever There's a Slow-Up

The *mobility* of production in modern plants is a marvel in itself. Skilled and semi-skilled labor are relieved of carrying materials, tools, or work in process. A river of work runs under their hands. Production flows!—and grows . . . That's the place of Service Casters in this "war of movement"—effortless swivel and roll under armament and equipment of all kinds, to *make the most of manpower.*

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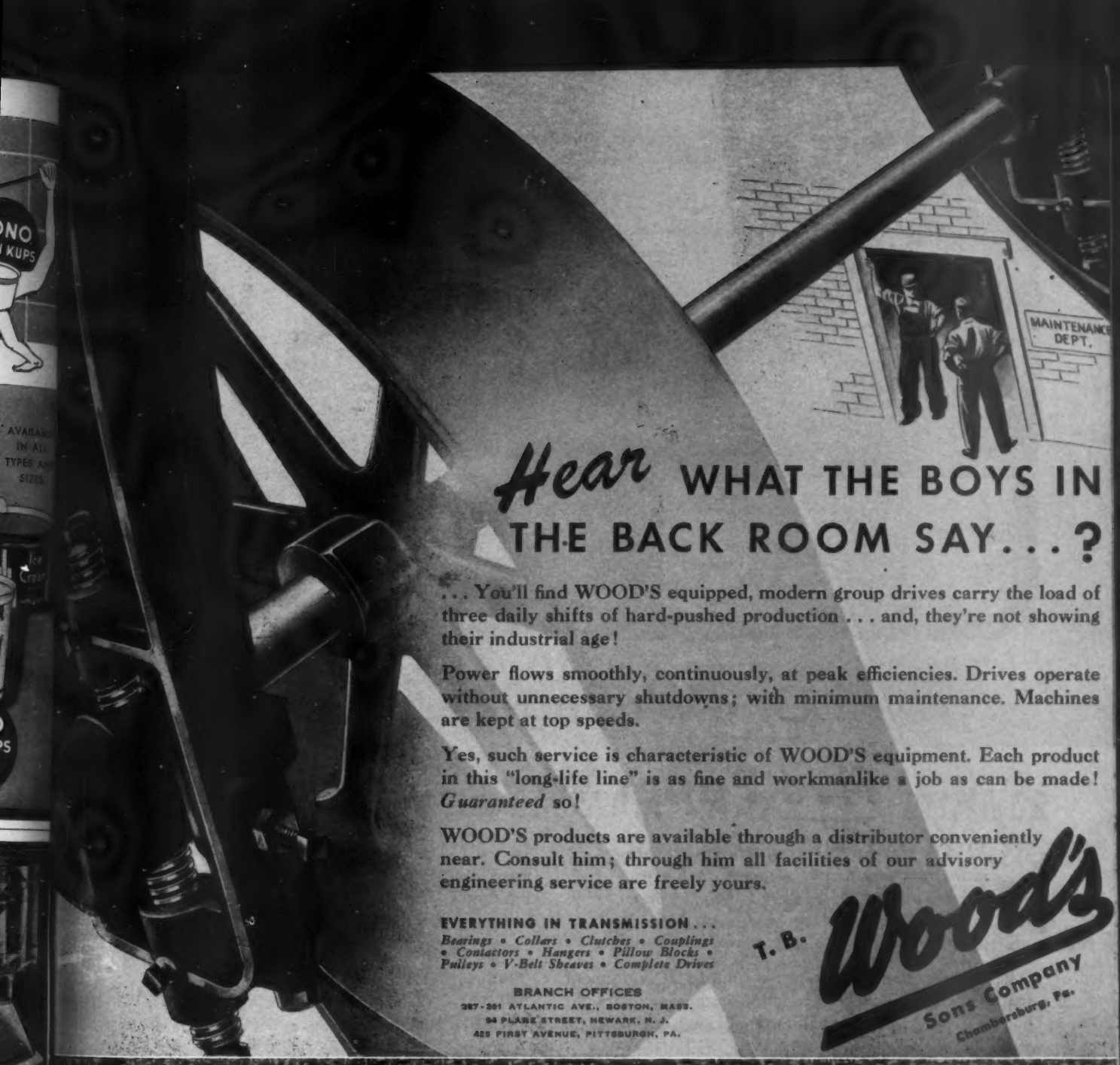

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. . . You'll find WOOD'S equipped, modern group drives carry the load of three daily shifts of hard-pushed production . . . and, they're not showing their industrial age!

Power flows smoothly, continuously, at peak efficiencies. Drives operate without unnecessary shutdowns; with minimum maintenance. Machines are kept at top speeds.

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Proper grouping of production machines reduces the load factor and connected horsepower.

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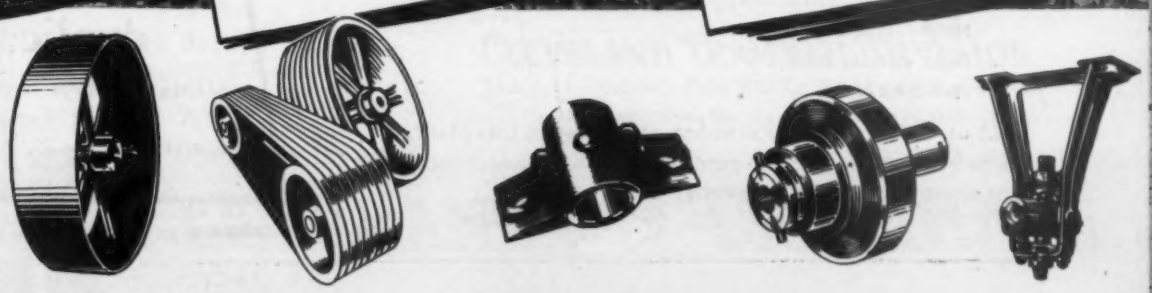
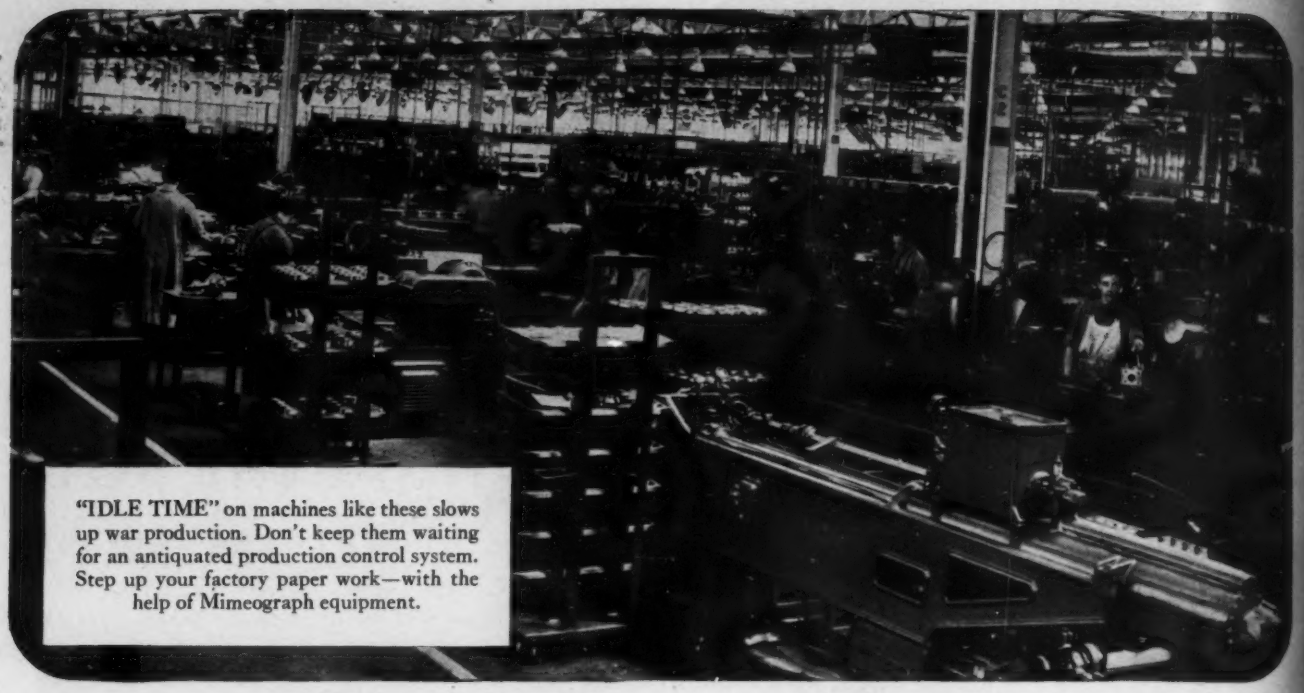


. . . . THE LONG-LIFE LINE



"IDLE TIME" on machines like these slows up war production. Don't keep them waiting for an antiquated production control system. Step up your factory paper work—with the help of Mimeograph equipment.

One Writing Performs Five Paper Work Functions

Read how a large manufacturer of heavy industrial equipment stepped up his production and efficiency by reducing five paper work functions to one writing—with the Mimeograph duplicator.

When a manufacturer of heavy industrial equipment switched to war work on a mass production "straight line" basis, he found himself entangled in a real problem of production control.

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shop "traveler,"
time cards, and
cost analysis.

With up to 500 production orders every day in this plant, the new "one-writing" system has already made important savings in productive time.

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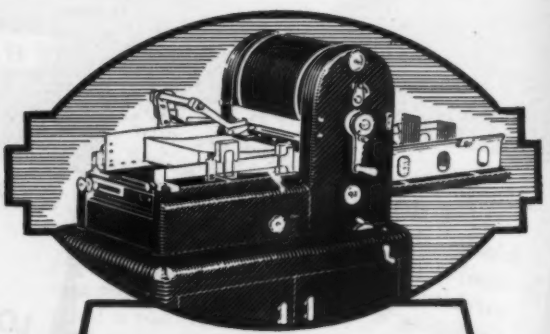
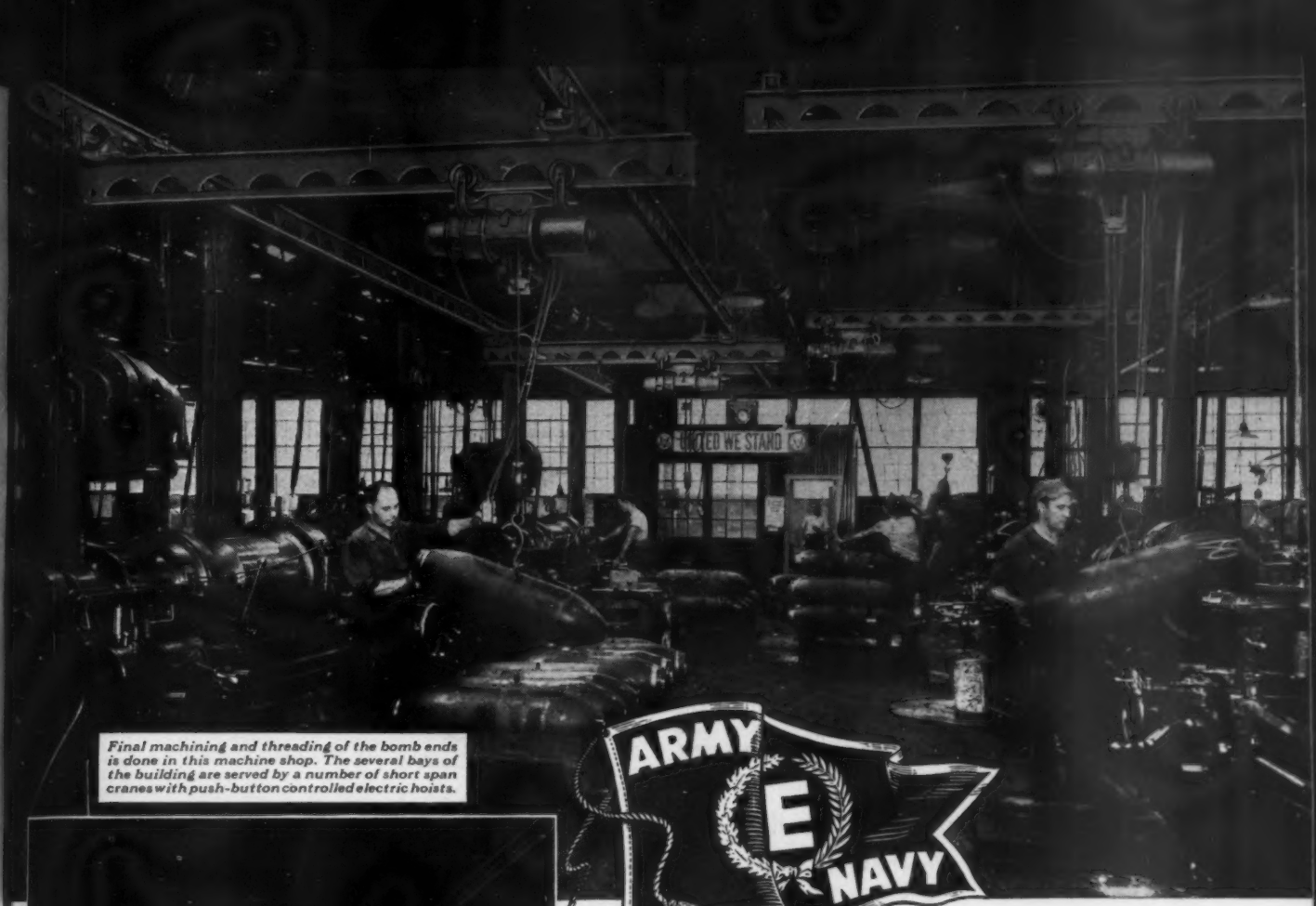
The Mimeograph distributor in your community is familiar with problems of factory paper work. He can help you speed up production through duplication. Call him—or write A. B. Dick Company, Chicago.



Mimeograph duplicator

MIMEOGRAPH is the trade-mark of A. B. Dick Company, Chicago, registered in the U. S. Patent Office.



Final machining and threading of the bomb ends is done in this machine shop. The several bays of the building are served by a number of short span cranes with push-button controlled electric hoists.

ARMY E NAVY

ARMY-NAVY "E" WINNER SPEEDS BOMB PRODUCTION with CLEVELAND TRAMRAIL

The hot semi-drawn bombs are taken from the reheat furnaces by the overhead Tramrail system to the draw bench for further drawing.

CLEVELAND TRAMRAIL is especially proud of the part it is playing in the production of large demolition bombs, in the plant of a large Pennsylvania steel company, because this concern recently was awarded the coveted Army-Navy "E" for its meritorious work. Every delivery promise made on the many contracts this plant has completed, has been beaten by a wide margin.

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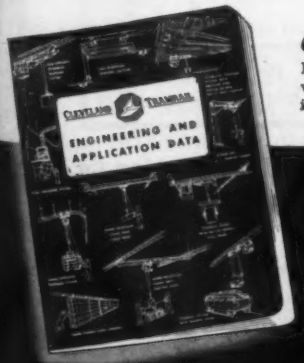
The work is hot, hard and dirty, necessitating equipment that is built to withstand the most rigorous of operating conditions. Cleveland Tramrail cranes of various types are used, some have all motions motorized; others are hand-propelled with only the hoists being motor-driven. Considerable overhead rail is employed for delivering the hot bombs by use of easy rolling carriers from the furnaces to draw benches, forging hammers, sand blasting machines, and other operations.



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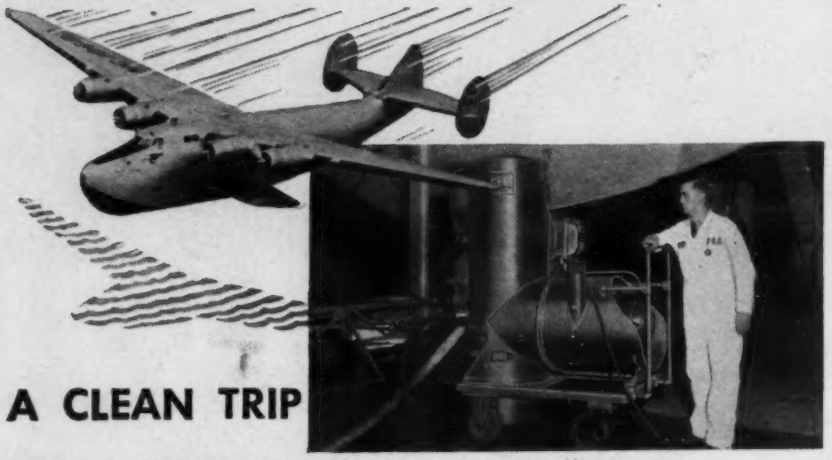
CLEVELAND TRAMRAIL

OVERHEAD MATERIALS HANDLING EQUIPMENT



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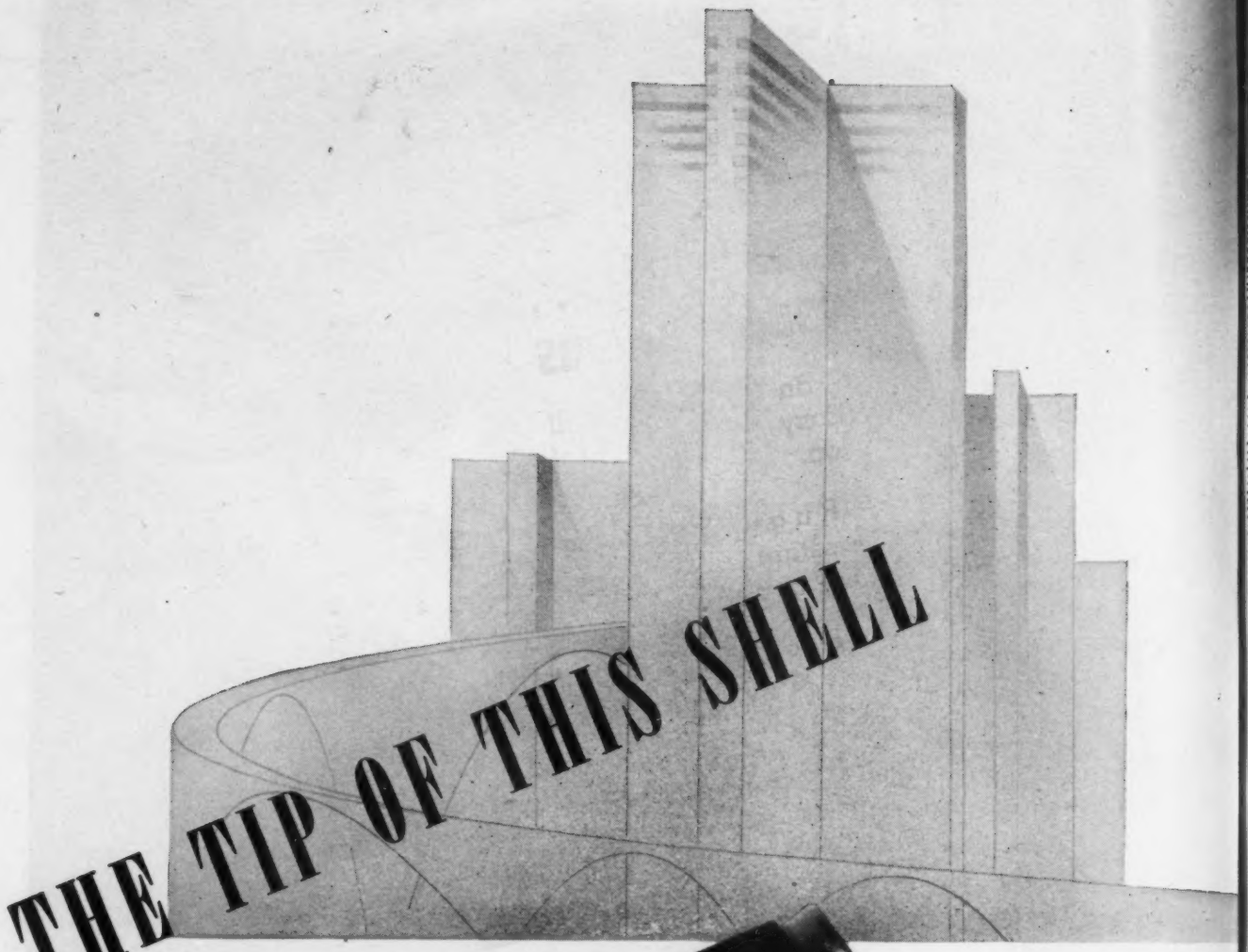

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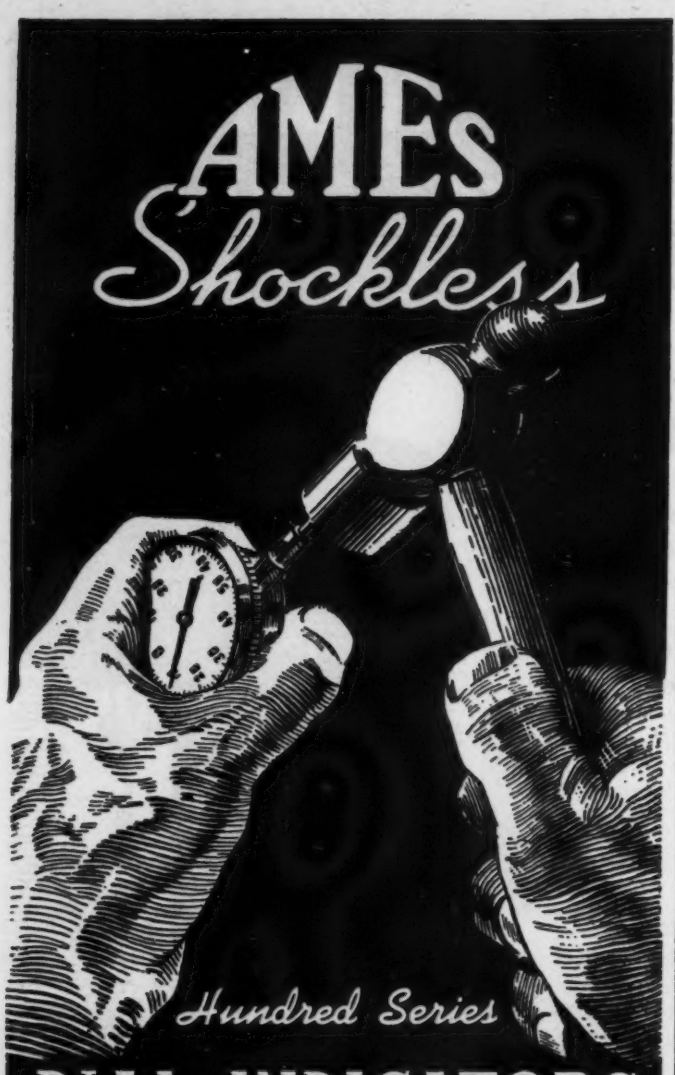

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he can't come to work
...HE'S GOT A BAD COLD!"

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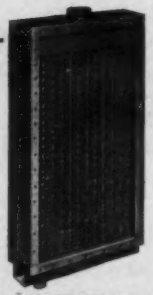
UNIT HEATERS will help to insure man-power against colds and accidents



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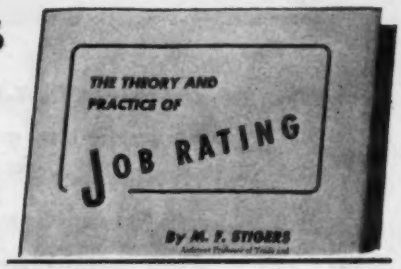
- for greater incentive
- for increased production
- for balanced purchasing power
- for better employee relations

Here is a book to help you rate every job in your plant accurately, set wages scientifically on such a job-rating plan, measure even the so-called intangibles on any job. It is the first published in this country to give a basic understanding of the fundamentals or theory of the actual practice of job rating and to present an accurate and scientific technique for the actual work of job rating.



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154 pages, $1.75

Some questions answered in this stimulating book

—should not wages be set on supply and demand instead of being based on the results of a theoretical calculation?

—what should be done to a rate when there is a temporary shortage of skilled labor to fill a special job?

—why not pay the "going rate" of the community?

—what effect should profit and loss have on wages?

—can the value of all types of labor and of technical and managerial positions be calculated?

Noteworthy for its original and unusually factual approach to job rating, this book offers an accurate, practical means of measuring every job element—including the intangibles heretofore considered unmeasurable. The fundamentals and philosophy underlying the subject are discussed; a scientific technique for the actual evaluation work is given; and questionnaires, rating scales, a cross comparison procedure, and pertinent data, plus full instructions, are provided. Employers and employees alike can understand this approach; and appreciate its substitution of facts for the opinions of rators. See how you can use it; send for a copy of the book to examine and read, today.

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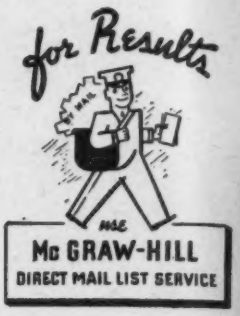

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Probably no other organization is as well equipped as McGraw-Hill to solve the complicated problem of list maintenance during this period of unparalleled changes in industrial personnel. These lists are compiled from exclusive sources, based on hundreds of thousands of mail questionnaires and the reports of a nation-wide field staff, and are maintained on a twenty-four hour basis.

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ANYONE CAN DRIVE PHILLIPS SCREWS!

In many of today's war-expanded plants, *raw recruits* now literally walk from the employment office into responsible screw-driving jobs previously rated as skilled work. They produce efficiently, too, because the job is simplified and made foolproof by Phillips recessed head Screws.

The Phillips driver centers *automatically* in the recess . . . can't slip out to injure hands or spoil the work. This means centered *driving force* . . . no fumbling, wobbly starts . . . no slant-driven screws . . . no burred or broken screw heads.

Snug fit and perfect centering of driver in the Phillips Recess enable workers to make *uniformly tight* fastenings . . . and do it with *less effort.* Driving speed is often *doubled* because easy-driving, skid-proof Phillips recessed head Screws make power-driving practical!

They cost less to use! Compare the cost of driving Phillips and slotted head screws. You'll find that the price of screws is a minor item in your total fastening expense . . . that it actually costs less to have the many advantages of the Phillips Recess!

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The Phillips Recessed Head was scientifically engineered to afford:

Fast Starting – Driver point automatically centers in the recess . . . fits snugly. Screw and driver "become one unit." Fumbling, wobbly starts are eliminated.

Faster Driving – Spiral and power driving are made practical. Driver won't slip out of recess to injure workers or spoil material. (Average time saving is 50%.)

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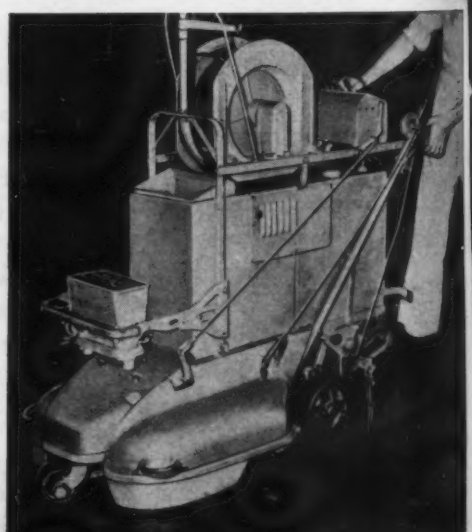
And rightly so, considering the extent to which *worker safety* depends on the maintenance of clean floors . . . on the speedy removal of hazardous oil and grease . . . and considering the *extraordinary* speed of a *Finnell Scrubber-Rinser-Drier.* This complete cleaning unit in the largest size has a capacity of 8,750 sq. ft. of floor per hour! Best of all, it requires but one operator for the scrubbing, rinsing, and drying operations . . . saves man-power for war-power.

Available in a wide range of models and sizes . . . each designed to meet specific needs. For literature, consultation, or free floor survey, phone or write nearest *Finnell* branch or Finnell System, Inc., 2502 East Street, Elkhart, Indiana.



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FLOOR-MAINTENANCE EQUIPMENT AND SUPPLIES

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With Their Help We'll Win

These women, machining precision parts on South Bend Lathes in a vital war plant, are typical of thousands of women who are doing their part to win the battle of production.

With eager hearts and nimble fingers, thousands of American women are working shoulder to shoulder with men in vital war industries — replacing those who have left their machines to defend their country. And they are doing a fine job of filling men's shoes, for they know that the battle of production must be won to keep their men at the front supplied with the guns, planes, tanks, bullets, and thousands of other things an army must have to be victorious.

Women learn to operate South Bend Lathes in a surprisingly short time. Not that just any girl can become an expert machinist or toolmaker over night. But on certain classes of work—the kind of work you would expect a beginner to do—women are highly successful.

Quick to appreciate quality, women like South Bend Lathes. They like the fully enclosed design with no exposed pulleys, belts, or gears—the smooth operation of conveniently placed controls—the absence of rough edges and sharp corners that might catch their clothing—the dependable precision that enables them to turn out maximum production, even when extremely close tolerances are specified. And, most of all, they appreciate the ease of operation which reduces fatigue to a minimum and seemingly shortens the work-day by hours.

South Bend Engine Lathes and Toolroom Lathes are made in four sizes, 9″ to 16″ swings. South Bend Turret Lathes are available in three sizes. Write for information, specifying size and type of lathe in which you are interested.

"HOW TO RUN A LATHE"
A valuable handbook for apprentice training. Explains the operation and care of engine lathes. 128 pages—365 illustrations. Sent postpaid for a 25¢ War Stamp.

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SOUTH BEND LATHE WORKS
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R/M NORTH CHARLESTON PLANT

AWARDED ARMY-NAVY "E"

It is a tribute to American workers that more and more Army-Navy "E" burgees are being awarded. It shows the continuing upswing of America's production-curve as we enter our second year of the war. It promises an ever-increasing output that will crush our enemies by its very weight.

The North Charleston plant of Raybestos-Manhattan, Inc., is now privileged to fly this flag, "awarded for excellence in production." It is an award not lightly given, not easily held. It is an achievement and a challenge at one and the same time.

Raybestos-Manhattan accepts this Army-Navy "E" pennant in the name of its workers . . . the men and women who tirelessly turn out great quantities of R/M packings. It is to them, rather than to management, that we take off our hat and make a low, graceful bow. Nice going, North Charleston.

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Handling materials in industry is the job of the P&H Zip-Lift. Now, it's merely a matter of pressing buttons to lift and lower heavy loads exactly where you want them. No trick to it, with such simple operation.

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IF YOU ARE RUNNING A WAR FACTORY

please accept this personal invitation

IF you are engaged in any kind of war production you are invited to make use of a free service which has already stepped up production in hundreds of factories—large and small.

Here is how it works. You simply telephone your nearest G-E lamp office, or your Electric Service Company, Electrical Jobber or Contractor. Say: "We want to do all we can to speed production. Will you have a lighting man call and see if he can help us?" The lighting man will carefully inspect your lighting, look for bottle-necks caused by glare or gloom or shadows. He'll show you how to correct those troubles—with the least possible use of critical materials.

You can't *lose* by accepting this invitation. And you may *gain* both in production and in employee morale. So won't you phone today?

TYPICAL LIGHTING TROUBLES WHICH HOLD BACK PRODUCTION

1. GLARE—from bare bulbs or wrongly placed fixtures. You may not realize how this is holding back your production.

2. SHADOWS—sometimes a worker's own shadow slows up his work. Moving a light fixture often removes this hazard.

3. GLOOM—dirt and grease on bulbs and reflectors can cut out *half* your light—and slow down production accordingly. Soap and water work wonders.

For wartime lighting help . . . Phone one of these G-E lamp numbers or your Electric Service Company or G-E lamp supplier

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Red Rock Bldg.

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BUFFALO.....LAfayette 7194
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CHICAGO.....HArrison 5430
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DALLAS.....LD 224
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DENVER.....MAin 6141
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DETROIT.....CHerry 6910
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KANSAS CITY.....Victor 7671
2100 Wyandotte St.

LOS ANGELES...Michigan 8851
Edison Bldg.

MINNEAPOLIS. GRanville 7286
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NEW YORK..Wickersham 2-6300
570 Lexington Ave.

OAKLAND.....HIgate 7340
1614 Campbell St.

PHILADELPHIA...KINgsley 3336
Mitten Bldg.

PITTSBURGH.....FAirfax 7911
601 E. General Robinson St.

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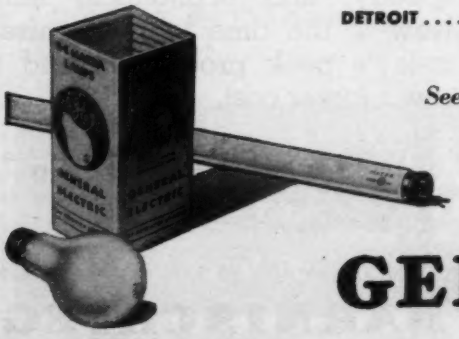
Oregon Transfer Bldg.

ST. LOUIS.....CHestnut 8920
710 N. 12th Blvd.

See your phone book for G-E Lamp offices in other principal cities



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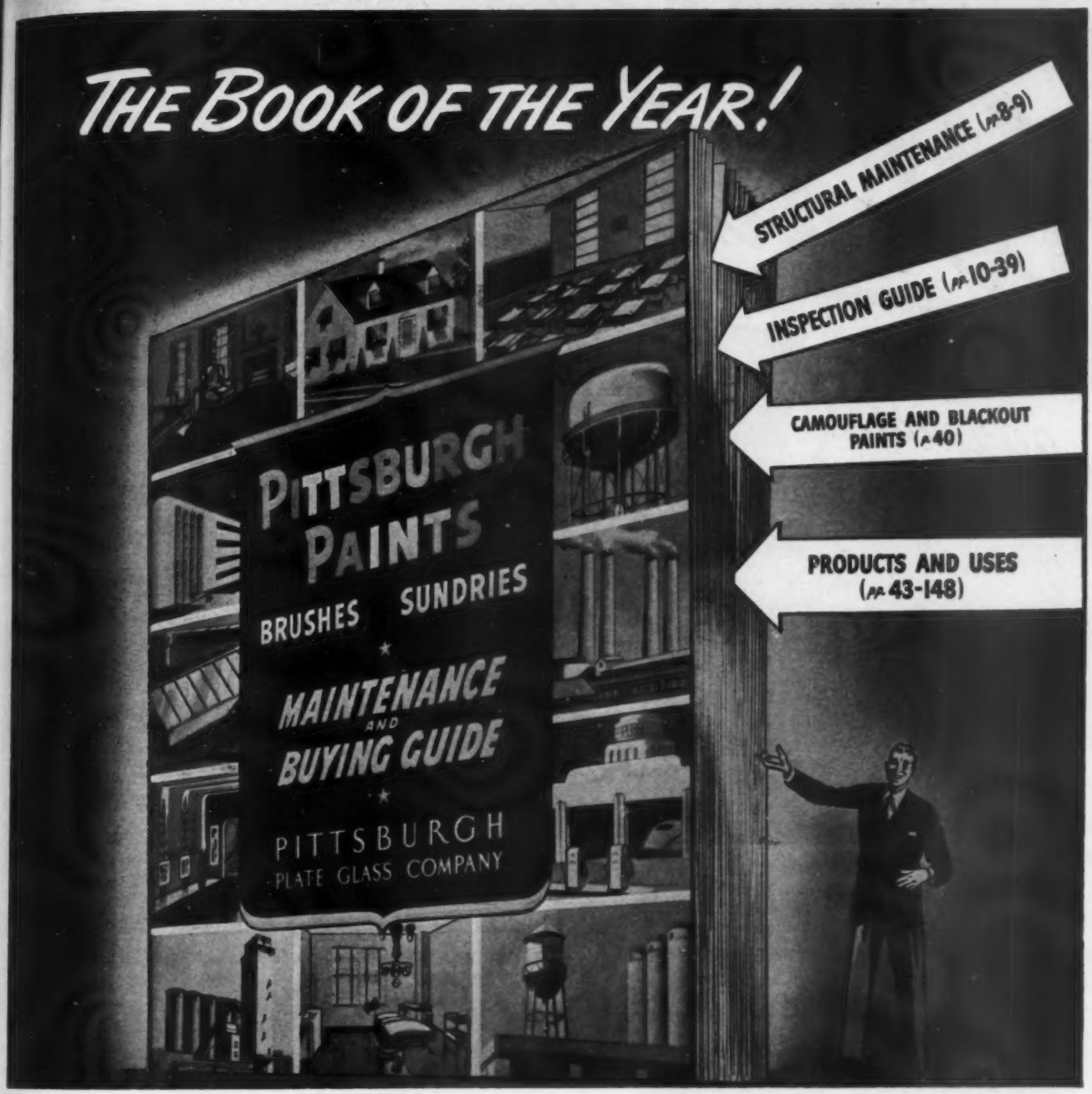
GENERAL ELECTRIC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PITTSBURGH PLATE GLASS COMPANY

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PITTSBURGH'S "Maintenance and Buying Guide" is the most comprehensive book of its kind ever offered. The first 48 pages contain a detailed maintenance guide for every type of surface in your factory from roof to cellar floors.

Here you will find the answers to practically any maintenance question that may arise in your plant. Also included in this book is a complete catalogue of paints, finishes and all other items necessary for property protection, with full instructions for their use.

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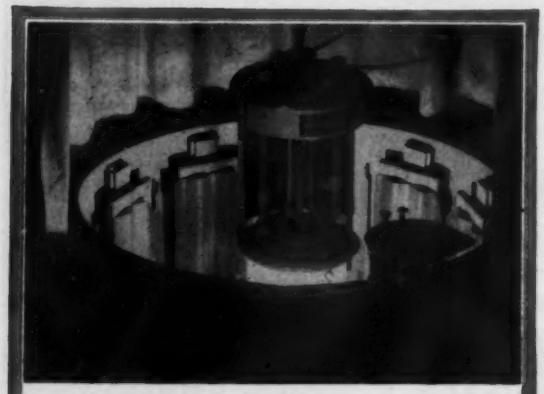
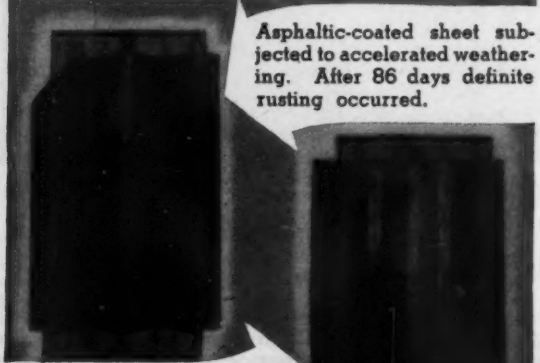
against { HEAT, MOISTURE, COLD, ACID FUMES



WEATHER-TESTED FOR EXTREMES—Here, in the Weather-Ometer, A P S panels were exposed to arc-light at temperatures up to 140°F., and then tested in cold-box at 10°F. below zero!



Asphaltic-coated sheet subjected to accelerated weathering. After 86 days definite rusting occurred.

Regular APS sheet subjected to 135 days' accelerated weathering. No checking, cracking or failures of any kind were found, only a slight dulling of the coating.

Triple Protection

1. Steel protects the structure
2. *Weather-Tested* compound protects the steel
3. Mica protects and reinforces the *Weather-Tested* compound

APS

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The wide acceptance of A P S Roofing, Siding and Flashings is indicated by the large number of outstanding industrials who have bought it repeatedly for uses under the most extreme corrosive conditions.

A P S Sheets have been *Weather-Tested* by Pittsburgh Testing Laboratories, and the results prove the value of the *Weather-Tested Coating*, an exclusive feature of A P S.

A P S is available through your local jobber. Ask him. If you cannot secure, write us direct.

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The TESTMASTER

REG. U. S. PAT. OFF.

UNIVERSAL

DIAL INDICATOR

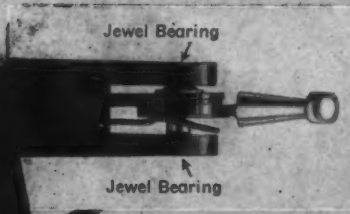
with the NEW

INDEX POINT

that locks in place and sets positively

ARMY E NAVY

strations are ce actual size



Serrations mesh positively. Interchangeable point locks on pivot. Low friction bearings.

Crown gear reduces friction and inertia — greater accuracy.

For lining up and testing machine work the Testmaster is exceptional.

You get more quality features in this *new* FEDERAL Universal Test Indicator.

The Testmaster universal test Indicator is chock full of detail features that you will appreciate more and more as you use it.

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Third — The point can be set to work in either direction; up or down.

Fourth — The universal clamp enables setting in any position (other holding bars can be substituted).

Fifth — It has dovetail slides on the bottom edge and back end for more universal setting.

Sixth — Its quality is worth more than the price.

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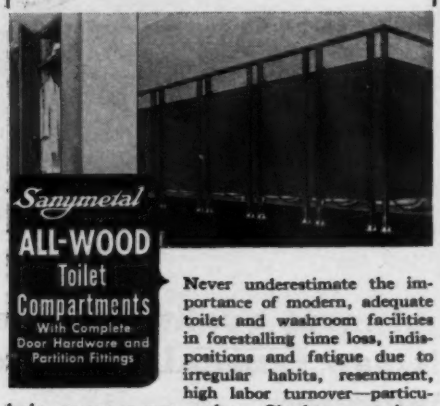
One time when a girl says "Dammit" because she is a lady!

. . . and that's when she finds someone has skimped in providing decent toilet room facilities . . . or permitted the use of makeshift, unsanitary toilet compartments. Being a lady . . . she intensely resents having to loiter with toilet room "standees" . . . or submit to primitive privacy.

. . . and when she's "burning up", mister,—her production isn't.



Never underestimate the importance of modern, adequate toilet and washroom facilities in forestalling time loss, indispositions and fatigue due to irregular habits, resentment, high labor turnover—particularly among women workers. Obsolete, unsanitary facilities offend and cause more trouble than low wages. Sanymetal All-Wood Toilet Compartments offer a quick, economical way to provide essential privacy, convenience and sanitation for men and women workers.

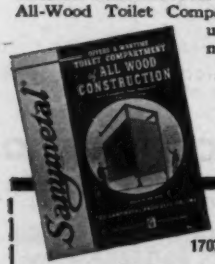
CONVENIENCE AND SANITATION are embodied in Sanymetal All-Wood Toilet Compartments to a degree unappreciated and unapproached by those lacking Sanymetal's *27 years of specialized experience* in building toilet compartments.

ENGINEERED-IN-WOOD FEATURES provide a strong installation free from dirt collecting pockets and ledges.

ONE ORDER INCLUDES EVERYTHING you need for the complete installation—partitions, doors, posts, headrails, hardware, fittings.

READY TO INSTALL without trial erection or assembly of materials.

Write for Bulletin 900 for complete data on Sanymetal All-Wood Toilet Compartments. See phone book under "Partitions" for Sanymetal Representative.



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New, *FREE* Manual Describes How Oakite Steam-Detergent Cleaning *SPEEDS UP* Maintenance and Cuts Equipment Down-Time!

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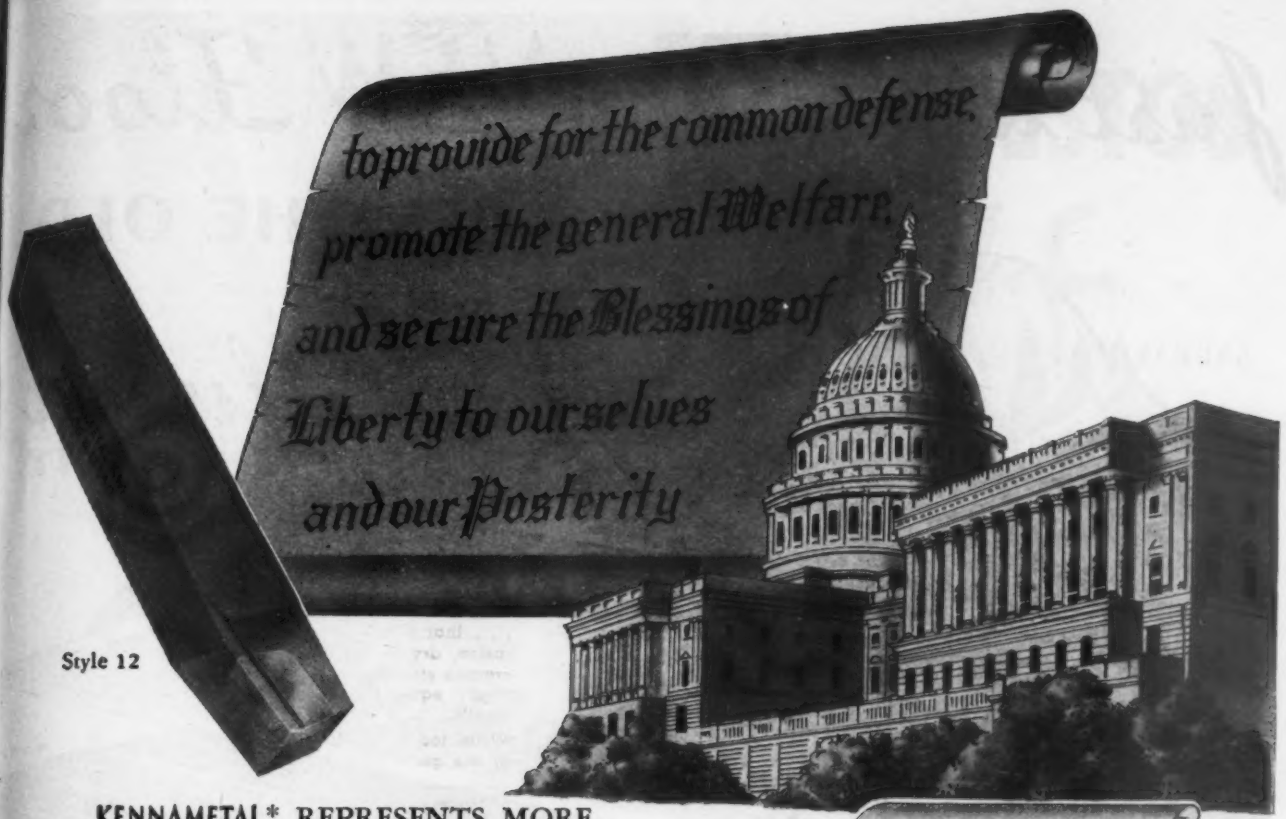

to provide for the common defense,
promote the general Welfare,
and secure the Blessings of
Liberty to ourselves
and our Posterity

Style 12

KENNAMETAL* REPRESENTS MORE THAN ITS INGREDIENTS

★These strong, hard and efficient steel-cutting tools required in their making more than merely the material ingredients.

Another essential ingredient was the protection and encouragement guaranteed under the Constitution of the United States of America to all citizens, including the men and women who make these tools.

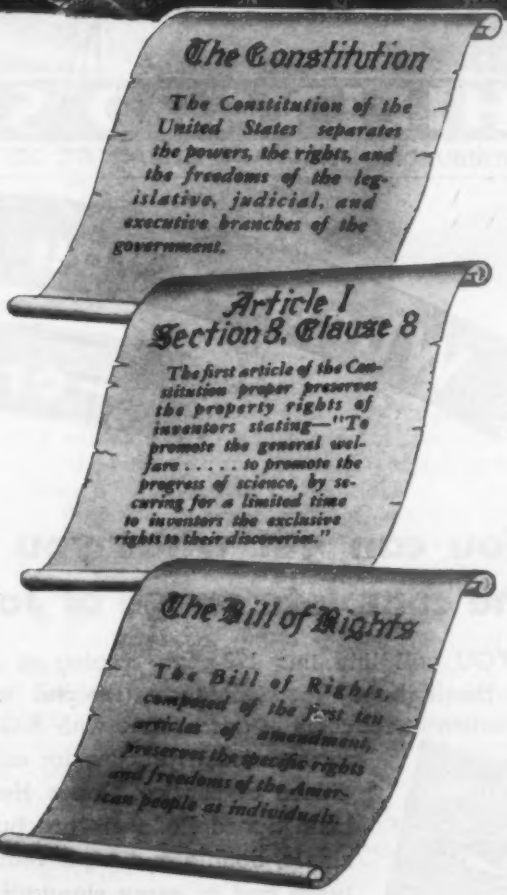
The Constitution also provided for the establishment of a patent system to secure to inventors, for a limited time, the exclusive right to their discoveries, and it was in reliance upon this encouragement and guarantee that, from 1936 to 1938, Kennametal was invented and perfected by the founder of McKenna Metals Co., as described in U. S. patents.

It is also because of provisions in the Constitution which guarantee freedom of trade that it is possible to introduce and sell Kennametal to machine shops in every state in the Union, as well as to those in allied countries.

American citizens are free because our form of government is based upon a Constitution which includes the Bill of Rights, and which provides for the making of laws by representatives in the Congress whom we elect.

We are proud in the knowledge that, in this national emergency, we have added strength to our country, and have made possible the more rapid production of arms.

That this new tool material was developed at this critical time was providential, but it would not have been possible without initiative which is characteristic of free men, and the independence of action guaranteed them by the Constitution.


The Constitution
The Constitution of the United States separates the powers, the rights, and the freedoms of the legislative, judicial, and executive branches of the government.
Article I
Section 8, Clause 8
The first article of the Constitution proper preserves the property rights of inventors stating—"To promote the general welfare . . . . . to promote the progress of science, by securing for a limited time to inventors the exclusive rights to their discoveries."
The Bill of Rights
The Bill of Rights, composed of the first ten articles of amendment, preserves the specific rights and freedoms of the American people as individuals.

*INVENTED AND MANUFACTURED IN THE U. S. A.

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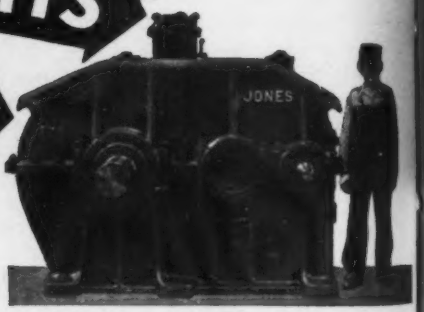
Whether you need THIS

—or THIS



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CUT AND MOLDED TOOTH GEARS • V-BELT SHEAVES • ANTI-FRICTION
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ROCKBESTOS A.V.C.

Prevents Shutdowns because

IT CAN'T GET A "HEAT RASH"

If repeated wire-failures in circuits around boilers, steam lines, furnaces, lehrs, soaking pits, kilns, etc., are slowing down your production, it will pay you to investigate Rockbestos A.V.C. — the wire with insulation that stands up in the most severe hot-spot installations.

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Eliminate down-time caused by continual wire maintenance by installing Rockbestos A.V.C. wire, cable or cord in your plant's hot-spots. Our engineers will gladly make recommendations from a line of 122 permanently insulated constructions.

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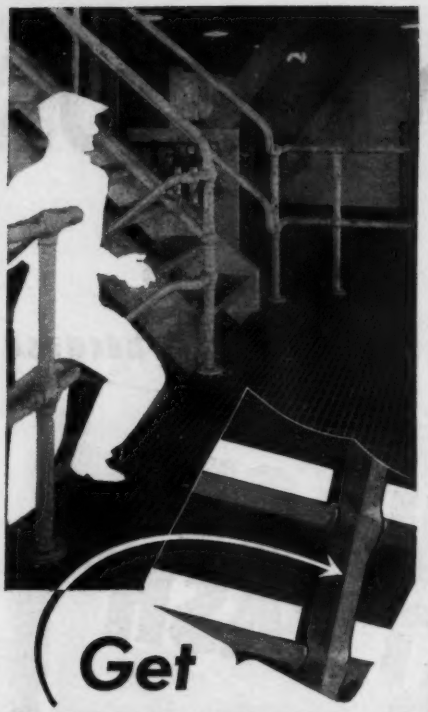

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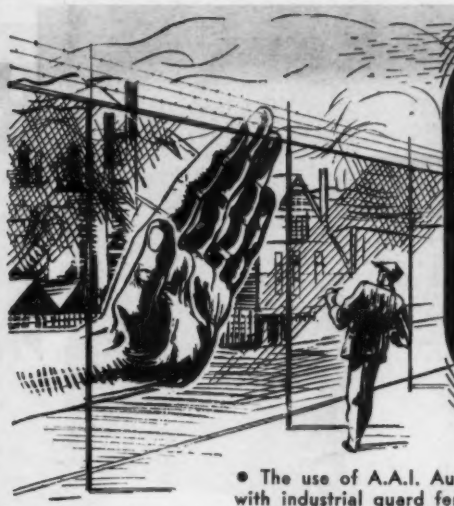

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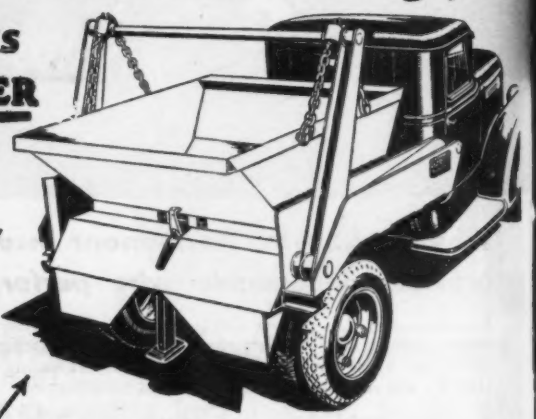

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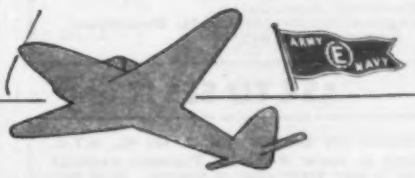

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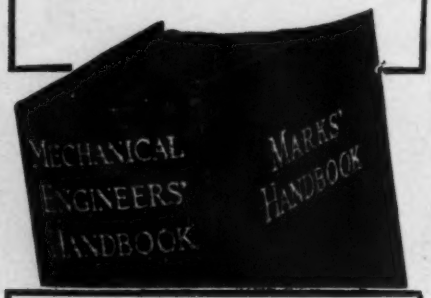

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WRITE FOR BULLETIN NO. 143

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Stanley FLUD-LITE Eye Shields

improve the work, protect the worker

Prevent painful, time-wasting accidents at your tool grinders with Stanley "Flud-Lite" Eye Shields.

PROVIDE TWO-WAY PROTECTION. Abundant light reduces the possibility of injuries. Sturdy Safety Glass protects the eyes from flying particles.

IMPROVES THE WORK. The extra light is especially helpful to new, unskilled workers. Because they *see* better, they do better work. There is less "burning" of tools, less waste of expensive, scarce tool steels.

30% MORE VISIBILITY. Two light bulbs with reflectors floodlight the work area. The large, 6" x 4" window of Safety Glass permits the operator to watch the work closely without danger. The shield is adjustable up and down, to suit the position of the operator. It cannot be moved to a non-guarding position without dismantling.

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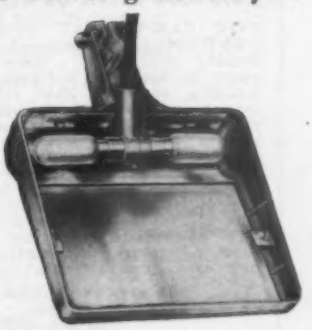

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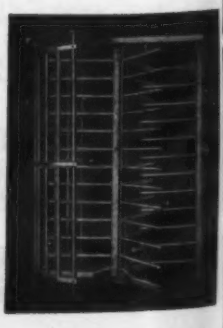

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It means that billions of dollars are being diverted from "bidding" for the constantly shrinking stock of goods available, thus putting a brake on inflation. And it means that billions of dollars will be held in readiness for post-war readjustment.

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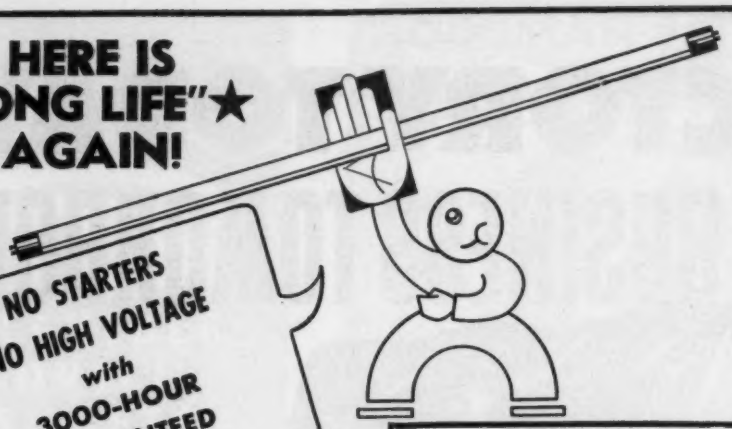

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It pays to check this page . . .

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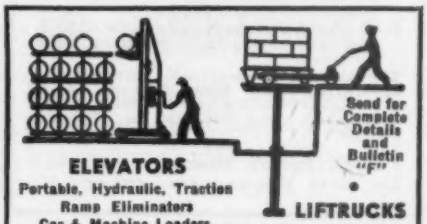

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WANTED—Hosiery dyer for number one job. Will consider a good second hand. Salaries open depending upon ability on past record of the individual. P-506, Factory Management & Maintenance, 330 W. 42nd St., New York, N. Y.

TOOL ENGINEER, for Connecticut plant manufacturing punched and machined metal products. Give age, education, experience, reference and salary expected. P-509, Factory Management & Maintenance, 330 W. 42nd St., New York, N. Y.

SUPERINTENDENT for chocolate factory. Experienced preferred. Must be graduate in Agricultural or Bio-Chemistry (with preferred minors in Bacteriology or Dairy Husbandry). Draft status 3-A, not over 50 yrs. Give complete details of academic training, experience, and personal qualifications. Send photograph. State salary. P-510, Factory Management & Maintenance, 330 W. 42nd St., New York, N. Y.

ELECTRICAL ENGINEER wanted by appliance manufacturer for the development of products to be manufactured at the war's end. Permanent position with ample salary for qualified engineer. Prefer detailed answer giving past earnings, experience, etc. Confidential. P-511 Factory Management & Maintenance, 520 N. Michigan Ave., Chicago, Ill.

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PLANT MANAGER—Director, Industrial Relations: Seasoned executive, Metal Trades. Morale survey; personnel evaluation; supervisory training; labor laws; contracts; grievance adjustments; Management-Employee Cooperation. PW-60, Factory, 330 W. 42nd St., New York, N. Y.

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(Continued from opposite page)

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Write for more information.

EVERSON ELECTRIC COMPANY
1126 Union Boulevard Allentown, Penna.

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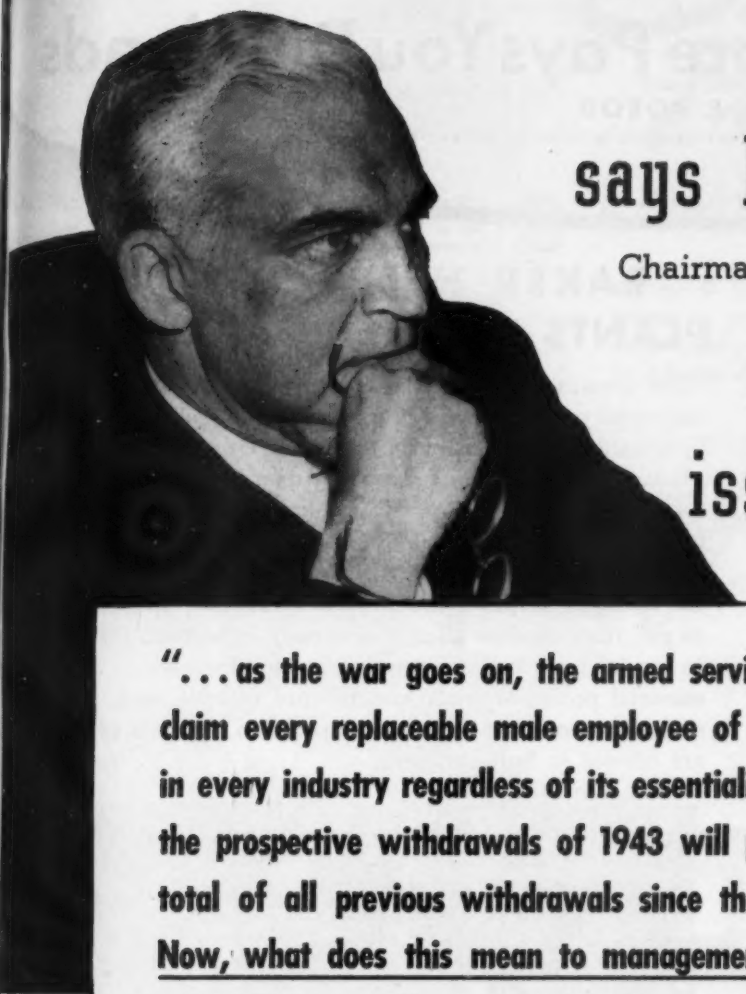


Wide World

says PAUL V. McNUTT

Chairman, War Manpower Commission

in the January issue of FACTORY:

"... as the war goes on, the armed services will almost certainly claim every replaceable male employee of military age and fitness in every industry regardless of its essentiality. In any average plant, the prospective withdrawals of 1943 will probably be equal to the total of all previous withdrawals since the start of the war .... Now, what does this mean to management in terms of personnel policy? It can only mean: Train! Upgrade!"

● This sweeping statement of Paul V. McNutt will have a far-reaching effect on every plant operating man. The imminent withdrawal of replaceable manpower in your plant, in all probability, will place even more emphasis on your training program.

Here's a suggestion we should like to make: your advertising manager, if he is a member of the National Industrial Advertisers Association, can be of immeasurable help to you. One phase of the activities of his professional association has been to assist plant operating men in training programs within their plants.

Skilled in the technique of making people understand *what needs to be done,* how to do it, and why, your advertising manager can cooperate with you in developing, rounding out, and participating in the operation of a training program for your plant.

This is only one way in which your advertising manager can assist you in your wartime extra-curricular plant activities. He also knows the techniques behind the organization of labor-management committees, production drives, conservation and scrap salvage campaigns, absenteeism programs and the entire gamut of wartime plant responsibilities in which you, as a plant operating man, are confronted. We believe it will be to your advantage to let him tell you HOW he can help.

THE EDITORS OF FACTORY

Industrial Truck Care Pays You Dividends

A. E. DOROD

ASSISTANT CHIEF ENGINEER, BAKER INDUSTRIAL TRUCK DIVISION, THE BAKER-RAULANG CO.

BAKER HELPS VITAL WAR PLANTS TO "*KEEP 'EM RUNNING*"

"The investment in regular inspection and lubrication of your industrial trucks is one of the best you can make." This statement from an article appearing in recent trade publications, written by a Baker engineer, is more true today than ever before. The unprecedented increase in industrial production and the huge amount of handling required in the movement of war materials, have created demands for power trucks which are taxing the productive capacities of truck manufacturers. Thus, with new equipment difficult to get, truck maintenance is extremely important, for trucks now in service must be kept running at top efficiency . . . So that the essential points of truck maintenance may be made available to everyone concerned with their operation, reprints of this article are offered in bulletin form.

Do You Know

That many possible causes of excessive wear or loss of power are not apparent in ordinary running but can be determined only by inspection?

Do You Know

That over-lubrication can often be as harmful as under-lubrication?

Do You Know

That it is desirable to blow the dust and dirt off the truck daily before oiling?

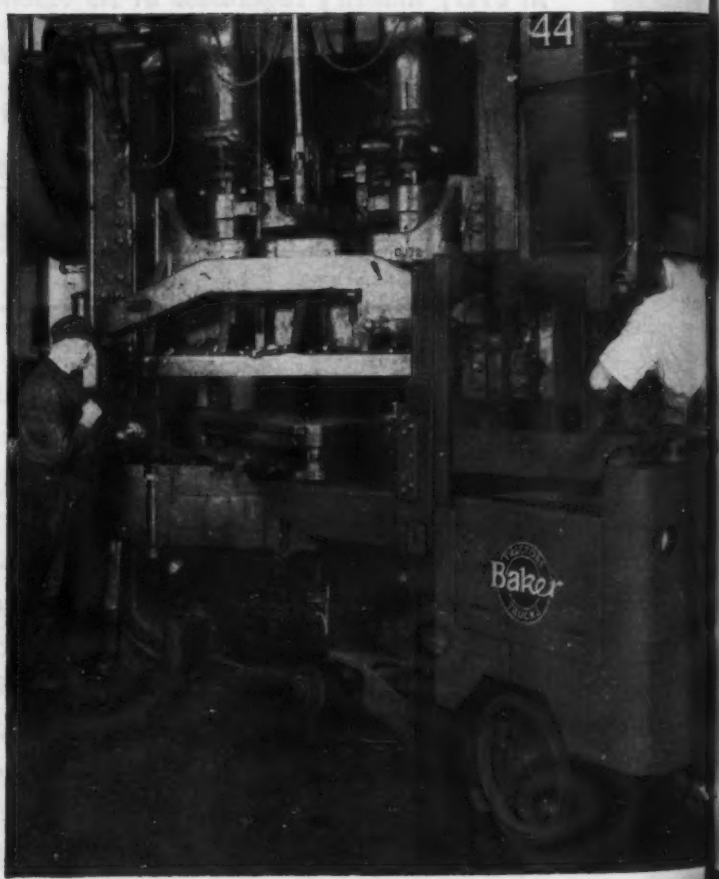
Do You Know

That overloading a truck is helping the Axis by breaking down irreplaceable equipment?

Do You Know

That service brakes should be tested for stopping with the heaviest load to be carried, and parking brakes for holding maximum load on steepest incline truck must negotiate?

These are a few of many points covered in the Baker bulletin "Industrial Truck Care." Write for your copy or copies today.



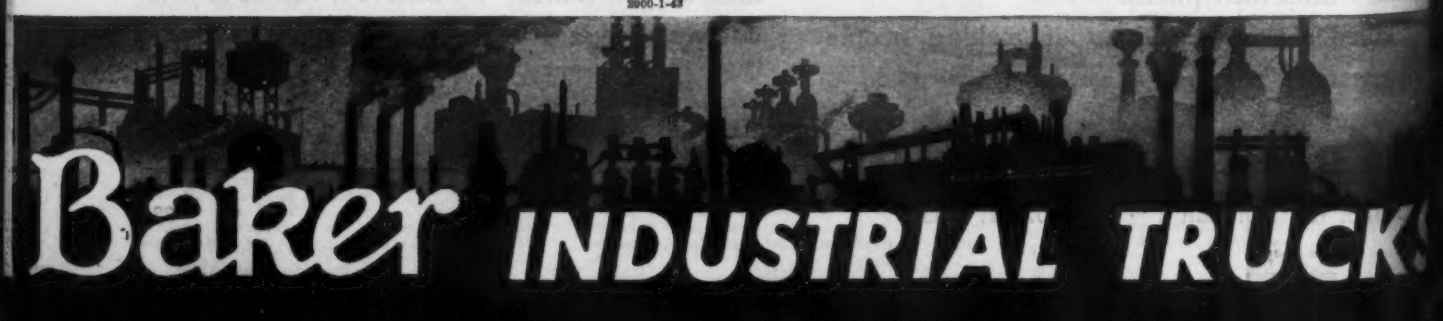
BAKER INDUSTRIAL TRUCK DIVISION

of The Baker-Raulang Company

2178 West 25th Street • Cleveland, Ohio

In Canada: Railway and Power Engineering Corporation, Ltd.

2000-1-43



Save MAN-HOURS.. *Protect* MAN-POWER

WITH SQUARE D COMBINATION STARTERS

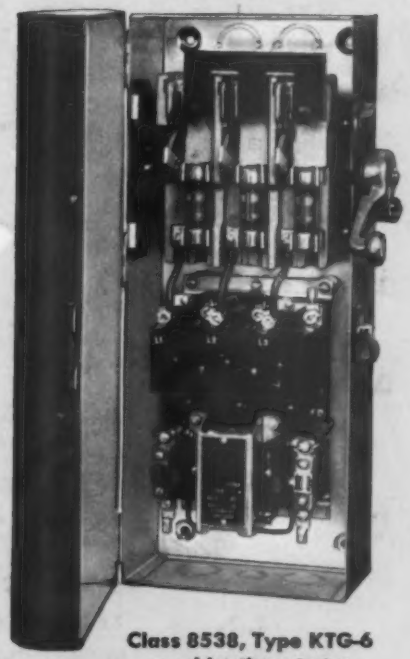
Square D combination starters (disconnect switch and motor starter in one cabinet) save valuable man-hours and material even before they are put in service—and every time inspection or maintenance attention is required thereafter.

Model 2K vertical Milwaukee milling machine manufactured by Kearney & Trecker Corporation

With only one device to mount and wire, installation is simpler—takes less than half the time needed to mount separate units. Complete accessibility makes servicing a fast and simple routine.

Safety features protect man-power. Cover interlock makes it impossible to open the combination starter unless the disconnect switch is in the "OFF" position. Switch handle may be padlocked "OFF" for positive protection while machine is being adjusted or repaired.

Enclosure steel and wiring materials are conserved because switch and starter are mounted in one box and already wired together.



Class 8538, Type KTG-6 combination starter

Standard Square D safety switches serve as the motor circuit disconnect. Operation is quick make and break. Switch blades are visible for easy inspection. Switch can be operated for testing after cabinet door is opened.

The Square D motor starter has straight line vertical action with double break, trouble-free silver contacts. All renewable parts, including magnet coil and contacts, can be inspected or replaced in a matter of seconds, using only a screwdriver *and without disturbing connections or removing the starter from the cabinet.*

CALL IN A SQUARE D FIELD ENGINEER

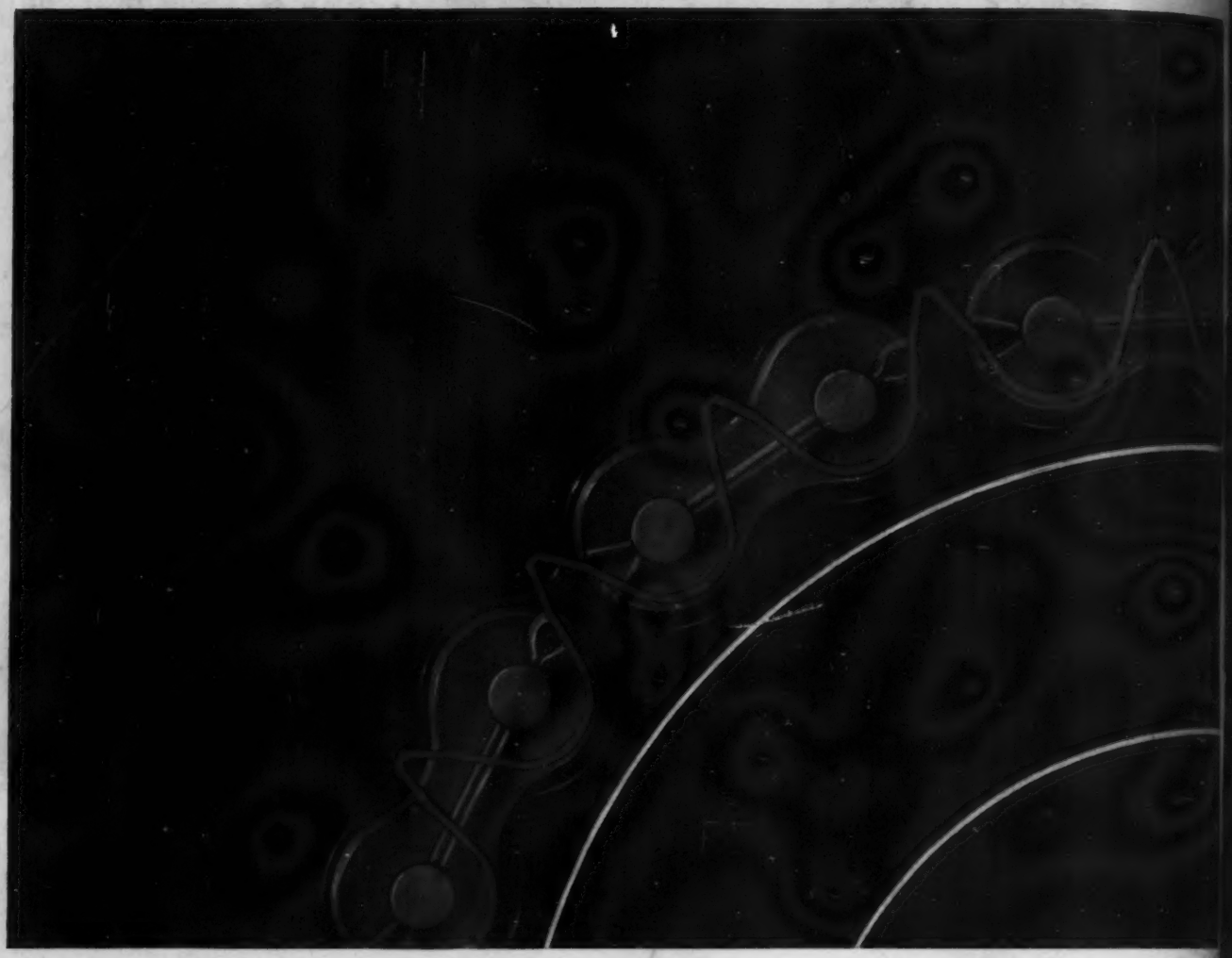
If you have a problem which involves electrical distribution or control, call in the nearest Square D Field Engineer. Backing him up in every Square D plant, are design and engineering specialists with complete research and testing laboratories at their command. There are Field Engineers in Square D branch offices in 52 principal United States and Canadian cities.

SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO



A Matter of Principle is Involved

. . . built into Morse Drives! Operating on the principle of TEETH NOT TENSION, Morse Drives eliminate the power waste . . . the slippage and frictional contact losses of power that sometimes occur when other drives are used.

Delivering power at practically 100% efficiency, every Morse Drive is a completely engineered power transmission unit so selected and designed as to render unfailing service under even the most adverse conditions.

Meeting the challenge of today's total war, Morse Drives are serving in tanks, planes, guns and ships . . . and in the factories, on the machines producing them . . . transmitting fractional h.p. in no-load timing devices, transmitting 5,000 h.p., and upwards, in steel mills.

Morse Drives will help you make important power savings, will help you speed production with their certain, positive action. Further, because Morse Drives are longer-lived, because they require a minimum of maintenance and service attention . . . they'll save you money.

Your nearby Morse Drive Engineer will assist you in engineering Morse Drives to your job.

SILENT CHAINS ROLLER CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE *positive* DRIVES

MORSE CHAIN COMPANY ITHACA N. Y. DIVISION BORG-WARNER CORP.